RADIO · TELEVISION · ELECTRONIC

SERVICE

VOL. 23

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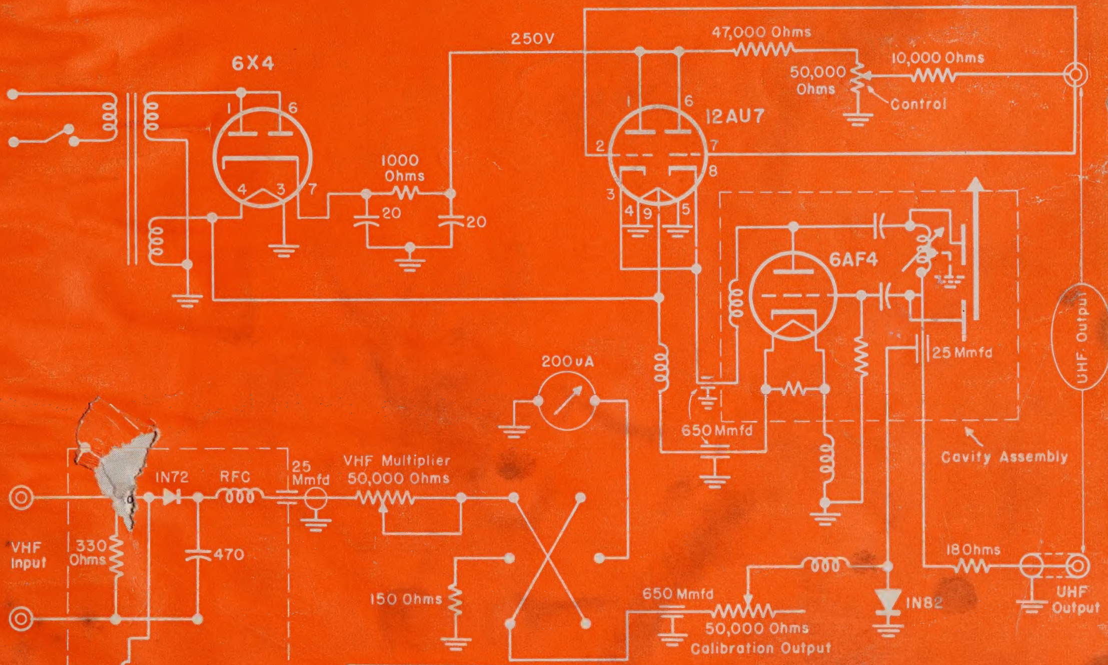
SEPTEMBER
1954

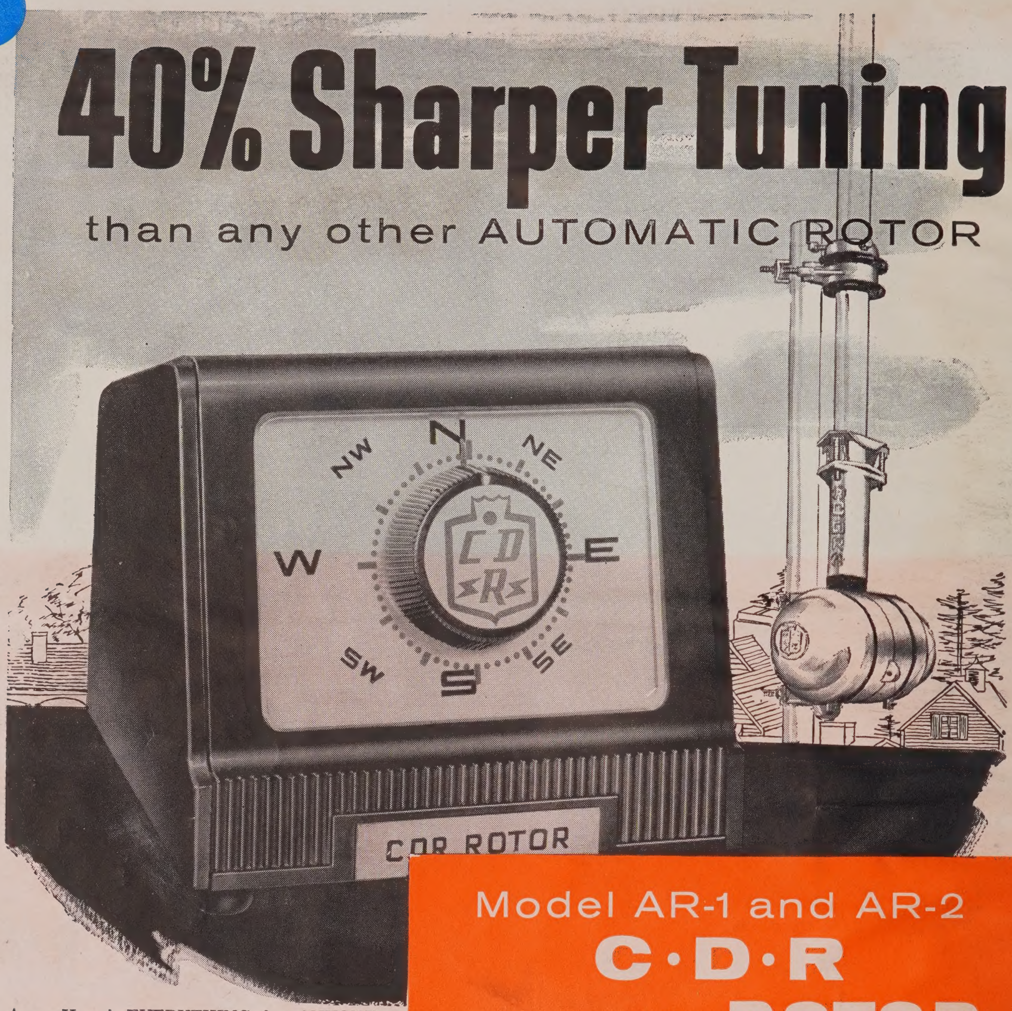

6X4
250V
1000 Ohms
20
20
47,000 Ohms
50,000 Ohms
10,000 Ohms
Control
12AU7
6AF4
25 Mmfd
UHF Output
200 uA
650 Mmfd
Cavity Assembly
IN72
RFC
25 Mmfd
VHF Multiplier 50,000 Ohms
VHF Input
330 Ohms
470
150 Ohms
650 Mmfd
50,000 Ohms
Calibration Output
IN82
18 Ohms
UHF Output
RFC

UHF signal-gain generator with center-loaded cavity as the tuning element.
[See circuit analysis, this issue]

D V DAWSON 2-56
1010 S ANDERSON
ELWOOD, IND
20D SR 2-11-54

40% Sharper Tuning

than any other AUTOMATIC ROTOR



Model AR-1 and AR-2

C·D·R automatic ROTOR

★ Here is EVERYTHING that ANYONE could ask for in a rotor! Powerful enough to turn any TV antenna . . . sturdy construction . . . and a handsome modern design plastic cabinet that AUTOMATICALLY turns the antenna to any position . . . AND ACCURACY that presents 40% SHARPER TUNING than any other automatic rotor!

. . . AND THEY ARE PRE-SOLD to consumers in every leading rotor market area with saturation TV SPOT ANNOUNCEMENTS!

Model AR-2 . . . complete AUTOMATIC rotor with thrust bearing . . . and handsome modern design cabinet, uses 4 wire cable

Model AR-1 . . . same as AR-2 without thrust bearing

Field Tested For Years

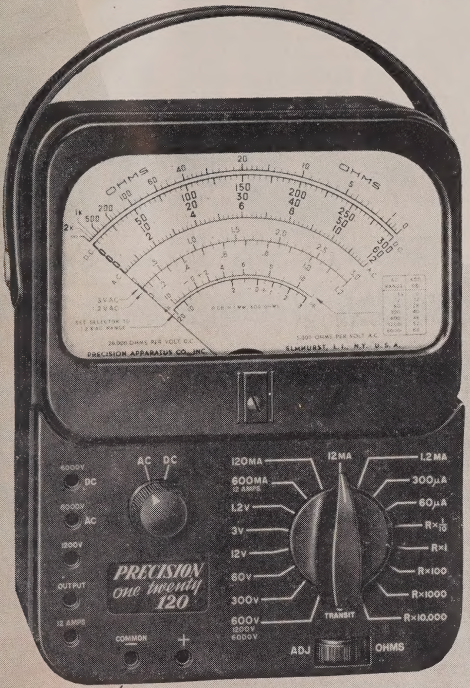
& Tried
& Tested
& Proven

CORNELL-DUBILIER
SOUTH PLAINFIELD, N. J.

THE **RADIART** CORP.
CLEVELAND 13, OHIO

More Ranges - More Visibility - More V.O.M.

the *PRECISION* MODEL 120



Gives You What You Want in a

HIGH SENSITIVITY MULTI-RANGE TEST SET

20,000 OHMS PER VOLT D.C.
5,000 OHMS PER VOLT A.C.

- **MORE RANGES** — The '120' gives you 44 . . . which start lower and go higher . . . to outrange any professional V.O.M. of similar size or type.
- **AN EXTRA-LOW RESISTANCE RANGE** — The '120' gives you a 2-ohm center scale range, powered by long-lived, internal 1.5 volt battery source.
- **AN EXTRA-LOW VOLTAGE RANGE** — The '120' gives you 1.2 volts full scale, A.C. and D.C.
- **AN EXTENDED LOW CURRENT RANGE** — The '120' gives you a 60 microampere first D.C. current range.
- **A LARGER AND EASIER READING SCALE FACE** — The '120' gives you a new, extra-large 5¼" meter with full 4¾" extra-wide window.
- **SIMPLE, POSITIVE RANGE SELECTION** — The '120' gives you an 18-position, positive-detenting, master range selector with low resistance, dependable, silver-plated contacts.
- **RUGGED, POSITIVE CONTACT JACKS and PLUGS** — The '120' gives you specially designed, low resistance, solid brass, banana type plugs and jacks.

Compare These Wide-Spread Ranges and Special Features:

★ **8 DC VOLTAGE RANGES:** 20,000 ohms per volt. 0-1.2-3-12-60-300-600-1200-6000 volts.

★ **8 AC VOLTAGE RANGES:** 5,000 ohms per volt. 0-1.2-3-12-60-300-600-1200-6000 volts.

★ **8 AC OUTPUT RANGES:** same as AC volt ranges. With built-in 600 volts blocking capacitor.

★ **7 DC CURRENT RANGES:** 0-60-300 Microamperes. 0-1.2-12-120-600 Ma. 0-12 Amperes.

★ **5 RESISTANCE RANGES:** self-contained batteries. 0-200-2000-200,000 ohms. 0-2-20-megohms.

★ **8 DECIBEL RANGES:** from − 20 to +77 DB. 0 DB = 1 Milliwatt, 600 ohms.

★ **EXTRA LARGE 5¼" RUGGED *'PACE'* METER:** 40 microamperes sensitivity, 2% accuracy.

★ **1% MULTIPLIERS and SHUNTS:** wire-wound and high stability deposited-film types employed throughout.

★ **ONLY 2 PLUG-JACKS SERVE ALL STANDARD RANGES:** separately identified and isolated jacks provide for extra-high ranges.

★ **"TRANSIT" SAFETY POSITION:** on master range selector protects meter during transportation and storage.

★ **CUSTOM-MOLDED PHENOLIC CASE and PANEL:** set a new standard for compact, efficient, laboratory instrument styling. Deeply engraved panel characters afford maximum legibility throughout the life of the instrument.

MODEL 120: complete with internal ohmmeter batteries, banana-plug test leads and operating manual. Over-all case dimensions: 5⅜ x 7 x 3⅛"........................Net Price: **$39.95**

WILL COLOR TELEVISION MAKE PRESENT TEST EQUIPMENT OBSOLETE?

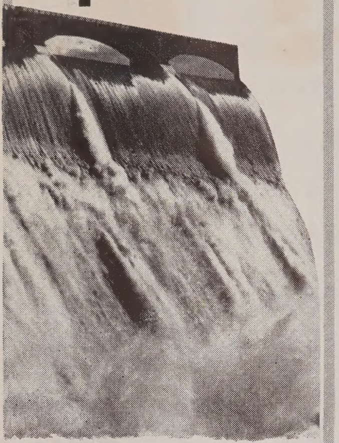
THE ANSWER IS NO! It will create even more uses for your PRECISION instruments! Color servicing will merely add one or two special-purpose units . . . which PRECISION will produce when field requirements are clearly defined.

As for V.O.M.'s — a volt is a volt, an ohm is an ohm and a mil is a mil . . . in color TV, monochrome or plain ordinary radio!

PRECISION TEST EQUIPMENT
Standard of Accuracy

***PRECISION* Apparatus Company, Inc.**
92-27 Horace Harding Blvd., Elmhurst, L. I., N. Y.
EXPORT: 458 BROADWAY, N. Y. 13, N. Y., U. S. A. Cables: Morhanex
CANADA: Atlas Radio Corp. Ltd., 560 King St. West, Toronto, 2B

25% more power



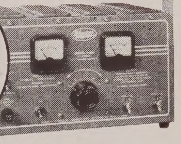
. . . *with the new*

ELECTRO "D-612"

6/12 Volt DC Power Supply

at no extra cost

ONLY
$39.95 NET
An assembled unit at a price comparable to kits.



2 Reasons why Electro "D-612" gives 25% more power and supplies 10 amperes at both 6 and 12 volts continuous.

1. **Heavy duty control transformer offers better regulation and withstands overloads for long service.**
2. **Electro application of larger selenium rectifiers, combined with EPL patented conduction cooling increases rectifier power rating.**

Other advantages of the "D-612" are rugged construction; continuously variable control and superior filtering (less than 5% ripple over rated ranges). Operates all 12 and 6 volt auto radios, plus relays, phone circuits, low voltage devices. For electroplating and battery charging. *Only Electro provides actual proof with performance charts.*

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Canada: Atlas Radio Corp., Ltd., Toronto

Vol. 23, No. 9

RADIO · TELEVISION · ELECTRONIC
SERVICE

September, 1954

LEWIS WINNER
Editor

B. BLOCK
F. WALEN
Assistant Editors

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Fabulous..Revolutionary ..Completely New..

MIGHTY MO*

*Pat. No. 2680196, others pending.

the most powerful antenna ever built, featuring TESCON'S NEW exclusive DDP (Double Diamond Phasing)

Tescon's miraculous Mighty Mo will make prime signal areas out of even the deepest fringe sections of the country.

Mighty Mo . . . complete with DDP, an entirely new and revolutionary concept of phasing, will trap even the weakest signal and perk it up to a clear, brilliantly sharp, deep-toned picture. Tescon absolutely guarantees that each and every Mighty Mo will perform where other antennas have actually failed!

Unshakeable proof, substantiated by exhaustive field tests, definitely shows that Mighty Mo **does more** than any other antenna manufacturer loudly **claims** his product will do. Theoretical ratings will never pay off. Rely on tested results . . . that's your real proof, that's your money in the bank.

Here's Mighty Mo's proof ...the results of ACTUAL FIELD TESTS.

- On channels 2 to 13, Mighty Mo outperforms every other antenna manufactured today.
- Higher uniform gain over all channels. Does not vary more than 1½ D.B. on any channel across band. Perfect on color TV.
- Clearer, sharper, deeper pictures on all channels.
- Higher average gain than 6 of the most advertised antennas.

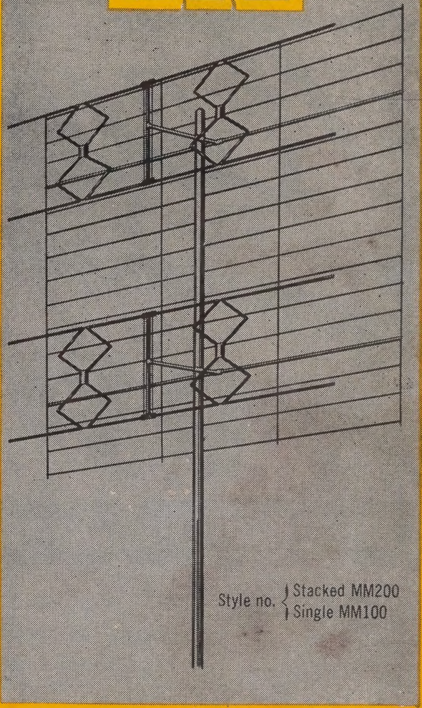
STOCK

this red-hot, fast moving, money-making antenna . . . right now!

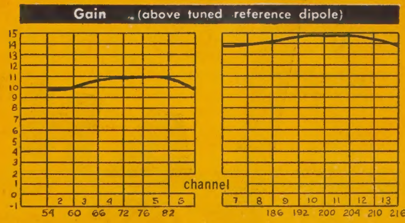
MIGHTY MO'S FEATURES

- DDP (Double Diamond Phasing) precision-timed phasing regulator enables the weakest of signals to be trapped and then boosted to a clear, magnificently sharp, photo-like picture.
- Flat response . . . a must for color reception.
- Largest screen area . . . over 70 sq. ft. Screen elements spaced less than 1/10 wave length apart for maximum reflector efficiency.
- Highest front to back ratio ever achieved.
- Absolutely no rear pick up or co-channel interference . . . no "venetian blinds."
- ½ wave element spacing on all channels for super-gain.
- Completely preassembled . . . not an erector set type antenna.
- Uniform gain response . . . no erratic audio and video patterns.
- Thoroughly tested for mechanical stress and strain . . . exceptionally rugged.
- Guaranteed to perform where other antennas fail.

TESCON TV PRODUCTS COMPANY
SPRINGFIELD GARDENS 13, NEW YORK



Style no. { Stacked MM200
Single MM100 }



Most uniform gain response ever recorded.
Does not vary more than 1½ D.B. on any channel.
Extremely important for quality color reception.

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TV

ANTENNAS

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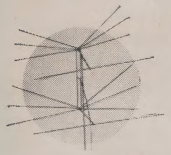
QUALITY
the World Over

GUARANTEED TO OUTPERFORM ANY EQUIVALENT TYPE ANTENNA OR

YOUR MONEY and LABOR COSTS BACK!

There's been enough words written about TV antenna performance. Now *. . . see the facts for yourself!* Compare any of the new PHILCO Super-Performance TV Antennas with any equivalent type on the market. If the new PHILCO does not give you the finest picture possible, your money back for the antenna *plus* your labor costs up to $10.00. Ask your PHILCO Distributor for complete details on this amazing offer!



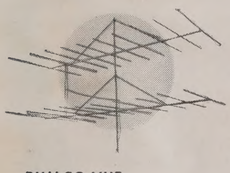
PHILCO VHF SUPER CONICAL

PHILCO TWO-BAY SUPER CONICAL ALL-CHANNEL ANTENNA

Strong signal pickup on VHF channels 2 through 13 . . . UHF channels 14 through 83 . . . ideal for fringe area reception . . . all-aluminum construction with dowelled elements: Part No. 45-3096-2. Rugged single bay design: Part No. 45-3096.

PHILCO TWO-BAY VHF LOW BAND YAGI ANTENNA

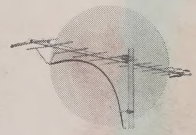
10 elements . . . all-aluminum . . . factory pre-assembled. Top performance on channels 2 through 6 . . . 13 db to 15 db gain on various channels. Single bay Part No. 45-3112-2 through 6. Stacked version harness Part No. 45-3267.



PHILCO VHF LOW BAND YAGI

PHILCO GOLDEN YAGI UHF ANTENNA

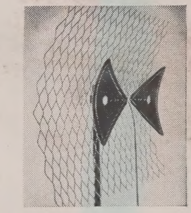
Designed for 300 ohm operation . . . all metal construction . . . 11 db to 12 db gain on various channels. "Cronak" coated components resist salt air . . . humidity. Six models cover entire UHF spectrum: Basic Part No. 45-1996.



PHILCO UHF GOLDEN YAGI

PHILCO PARAFLECTOR ALL-CHANNEL UHF ANTENNA

Pre-assembled, all-aluminum . . . 8 to 10 db gain . . . outstanding fringe area performance . . . immediate mounting on existing masts. Part No. 45-3071. Bow Tie, Part No. 45-3069 and Bow Tie with reflector, Part No. 45-3070 give top quality pictures in many UHF areas.



PHILCO UHF PARAFLECTOR

PHILCO CORPORATION ACCESSORY DIVISION

"A" AND ALLEGHENY AVE. • PHILADELPHIA 34, PA.

SPRAGUE **PRODUCTS COMPANY** Distributors' Division of the Sprague Electric Company
NORTH ADAMS, MASSACHUSETTS · MOhawk 3-6511

An Open Letter to All Servicemen About Capacitor Test Equipment

Capacitors are one of the building blocks of electronic circuits. And good capacitor test equipment is something no service technician can afford to be without! Testing "by guess and by gosh" will lose more valuable time in a year than will pay many times over for the best equipment.

Sprague makes two complementary instruments for the service profession which should be on your bench---the famous Tel-Ohmike Analyzer, Model TO-4, and the new Kwik-Test checker, Model KT-1.

Where complete capacitor tests are required, our Model TO-4 Tel-Ohmike has no peer. It tells you whether capacitors are good, bad, or in-between on all important electrical characteristics.

The Tel-Ohmike tests paper, mica and ceramic capacitors for insulation resistance, giving direct meter readings up to 20,000 megohms. You don't have to "crystal ball" the blinking of a neon lamp oscillator used in competitive instruments when you have a TO-4!

It measures capacitance of all capacitors up to 2,000 µf by the reliable Wien bridge method. Five ranges are provided for increased accuracy. One of these is a special low range for checking miniature micas and ceramics, automatically compensating for the inherent bridge wiring capacity. No other analyzer has this feature. Having a "magic eye" tube gives a sharp, accurate bridge balance. Power factor measurements of electrolytic capacitors on the bridge have three ranges for increased accuracy.

The TO-4 also measures leakage current of electrolytic capacitors under rated d-c voltage. And the voltages are continuously adjustable and metered so you really know that your readings are correct, unlike those made on instruments with fixed taps on voltage dividers.

The TO-4 also measures the a-c resistance of resistors from 10 ohms to 25 megohms.

The price of our TO-4 Tel-Ohmike has never been increased. At $73.50, it is a bigger bargain today than it ever was.

The KT-1 Kwik-Test is the electronic equivalent of a "go-no go" gauge. Without unsoldering the leads of capacitors, you can rapidly spot-check for open or short circuits or intermittents. It doesn't attempt to do the complete job of the TO-4 in making

Don't Be Vague! Ask For Sprague **QUALITY ELECTRICAL AND ELECTRONIC DEVICES** actual measurements, but within its limitations set by the basic laws of physics it does a fine job of supplementing the Tel-Ohmike. The Kwik-Test is particularly good in checking ceramic capacitors which rarely become "leaky" but usually "short" out completely. It takes only a few minutes to go over a TV set front end completely with the KT-1 or to check the capacitors in a deflection yoke, avoiding the need for unsoldering myriads of almost leadless discs unnecessarily. If the KT-1 did only this it would be worth far more than its modest price of $34.50.

I'll be glad to send you an explanatory leaflet on the Model KT-1 Kwik-Test by return mail if you will write me your name and address.

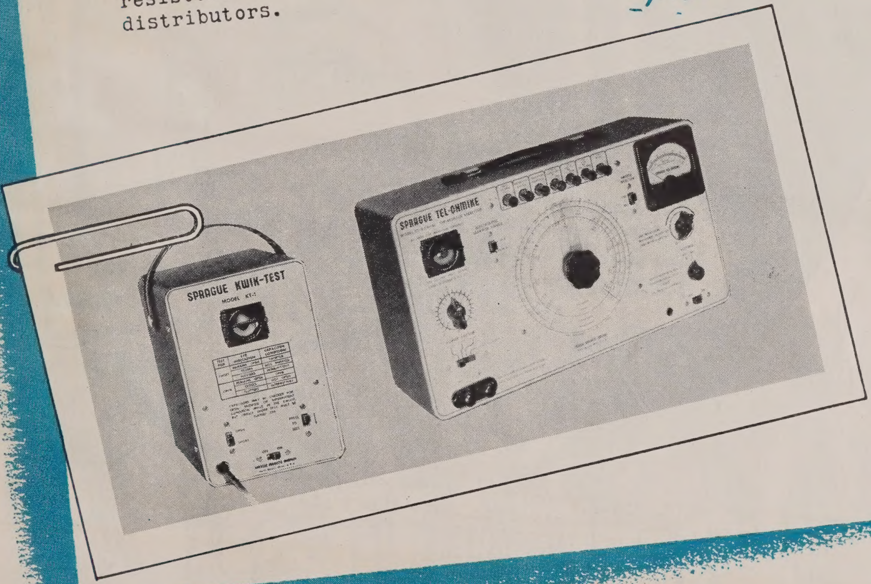
A picture of our Model KT-1 Kwik-Test and Model TO-4 Tel-Ohmike is attached. Aren't they attractive? They'll be a handsome, useful addition to your array of modern service equipment!

Why not have your regular Sprague distributor give you a demonstration of both the KT-1 and the TO-4 without delay.

Sincerely,
SPRAGUE PRODUCTS COMPANY
Harry Kalker
Harry Kalker
Sales Manager

HK/vmh
Att.
P.S. If you're one of the servicemen who still hasn't learned about the unequalled reliability of Sprague capacitors and resistors, let us tell you the names of your nearest Sprague distributors.

HK



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"SILVER
IT'S FULLY GUARANTEED!
IT'S SHARPER!
1 YEAR WARRANTY
THE NAME'S ON THE FACE FOR YOUR PROTECTION!
IT'S CLEARER!
SYLVANIA
SILVER SCREEN 85

IT'S SYLVANIA'S

"SCREEN 85"

The Picture Tube with three amazing design features!

SILVER-ACTIVATED SCREEN...SUPER ALUMINIZED REFLECTOR

PRECISION-FOCUS ELECTRON GUN

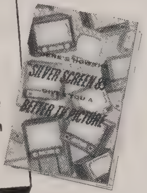
Here is a truly great achievement in television picture tubes! Sylvania's "SILVER SCREEN 85" is the last word in design and engineering perfection. It's the picture tube with the SILVER-ACTIVATED SCREEN, to produce television's sharpest, clearest pictures; the SUPER ALUMINIZED REFLECTOR to catch and use all available light, giving pictures more depth, more dimension than ever before; the PRECISION-FOCUS ELECTRON GUN that scans every inch of the screen, making images stand out in pinpoint detail.

From foreground to background, pictures are razor-sharp, crystal clear! Blacks are *really* black—whites are *true* white. Only professional movies can duplicate the "Silver Screen 85" picture. It's a SUPER ALUMINIZED PICTURE TUBE, designed to give top performance, made to the highest quality standards, and backed by the world's most experienced manufacturer of picture tubes!

YOU CAN BE PART OF THE BIGGEST PICTURE TUBE CAMPAIGN IN THE INDUSTRY!

All this promotion material is yours FREE —All you have to do is ask for it!

- attractive window streamers . . .
- colorful counter and window displays . . .
- radio and TV commercials for you to use on your local stations . . .
- newspaper mats . . .
- publicity releases . . .
- postcards . . .
- envelope stuffers . . .
- a brand new booklet to describe the revolutionary "Silver Screen 85" to your customers . . .



YOUR SYLVANIA DISTRIBUTOR HAS THE "SILVER SCREEN 85" NOW! MAKE SURE YOU ARE PART OF THIS PROFIT-PACKED PROMOTION—CALL HIM, WRITE HIM, SEE HIM TODAY!

24 MILLION PEOPLE—INCLUDING YOUR CUSTOMERS—WILL HEAR ABOUT THE "SILVER SCREEN 85" EVERY WEEK ON "BEAT THE CLOCK"! 80 STATIONS NOW REACH 93% OF THE TV HOMES IN THE COUNTRY.

Right in your own town! That's where Sylvania will help you sell the "Silver Screen 85"! Hard-selling commercials will tell millions of people every week that you're the man to see for a new "SILVER SCREEN 85."

SYLVANIA

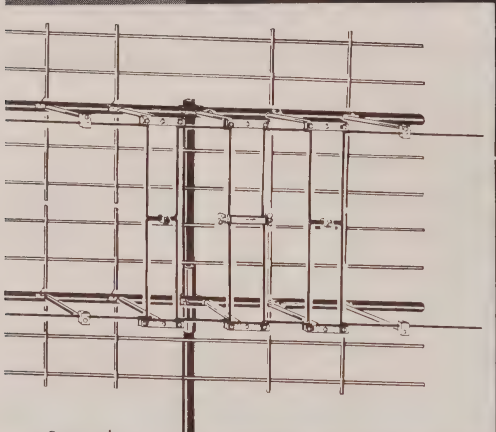
Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.

In Canada: Sylvania Electric (Canada) Ltd., University Tower Building, St. Catherine Street, Montreal, P. Q.

LIGHTING • RADIO • ELECTRONICS • TELEVISION

CO-TRAP gives highest FRONT TO BACK RATIO of 5 major competitors!

introducing the all channel SKYLINE IMPERIAL *with Co-Trap*



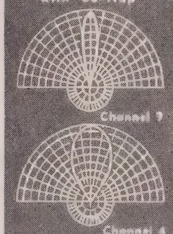
Patented

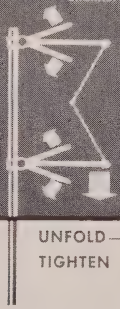
AMAZING FRONT TO BACK RATIO TEST DATA

FREQUENCY (Megacycles)	RELATIVE VOLTAGE 2-bay Model 701 (Without "Co-Trap" Screen)	 Skyline Imperial Model 701-CT (With "Co-Trap" Screen)
50	9.12	**10.1**
60	9.4	**18.1**
70	9.4	**14.**
80	6.8	**14.8**
90	7.4	**14.8**
170	3.5	**12.9**
180	5.1	**14.**
190	6.4	**21.9**
200	4.1	**16.9**
210	4.1	**14.**
216	3.5	**20.**

Independently tested by the Research Division of Mark Products Co. of Chicago, Edward F. Harris, Chief Engineer

CHARACTERISTIC VHF BAND PATTERNS with "Co-Trap"





UNFOLD—TIGHTEN

3000 WITNESSES AT GRAND DEBUT WATCH THE "IMPERIAL" OUTPERFORM 4 MAJOR COMPETITORS!

Side-by-side comparison test proves "Imperial" far superior at rejecting co-channel interference!

Two competitors failed completely—pictures entirely blotted out.

Another two showed inferior pictures and much interference.

Coming through with flying colors, the "Imperial" gave a clear picture free of interference.

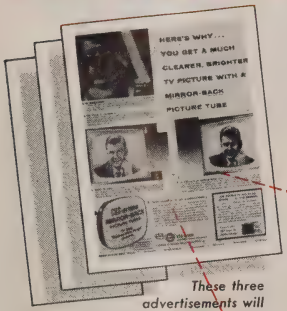
Full size 5000 square inch screen.
All aluminum—extra heavy throughout.
Completely pre-assembled.

MODEL No. 701-CT (2-bay, with "Co-Trap" screen) ⟶ LIST **$27.50** Packed 2 per carton

MODEL No. 700-CT (4-bay, with "Co-Trap" screen) also available—$57 list

SKYLINE MFG. CO. 1652 Rockwell Ave., Cleveland 14, Ohio

Now, TV set owners can understand benefits of Aluminized Tubes!


HERE'S WHY... YOU GET A MUCH CLEARER, BRIGHTER TV PICTURE WITH A MIRROR-BACK PICTURE TUBE

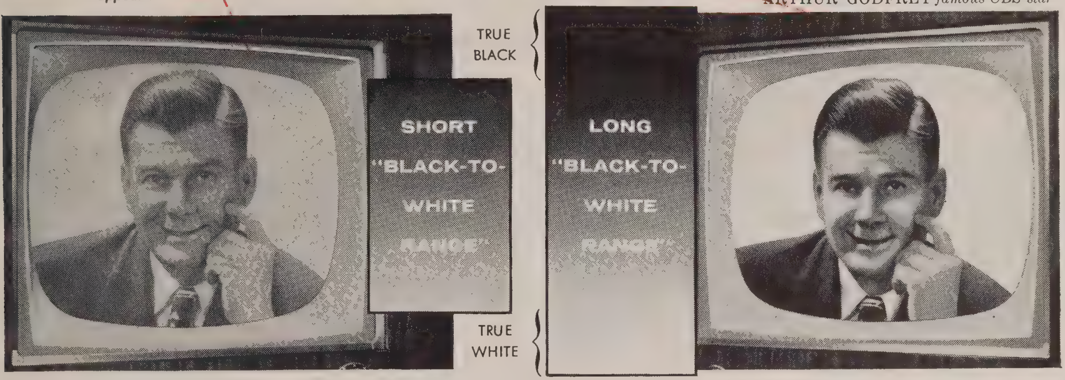
These three advertisements will appear in POST *this fall.*

THESE ADVERTISEMENTS IN POST EXPLAIN THAT:

1. **IN MAGAZINES,** *the pictures* you see (when magnified) are made by a series of tiny dots applied to the paper *mechanically.*

   ON YOUR TV SCREEN, *the pictures* are also made by a series of dots (which appear as lines) applied *electronically*. These dots, in both cases, create a variety of tones including black, a range of grays, and white. BUT, it is the LENGTH of this "Black-to-White Range" (the gray scale) that makes the picture excellent, good, fair, or poor.

ARTHUR GODFREY *famous CBS star*



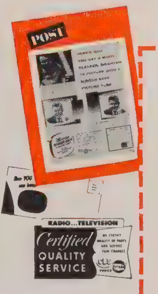
2. **ORDINARY PICTURE TUBES** used in most TV sets made before 1953 produce a *short* "Black-to-White Range." While the picture is good, the picture tube cannot develop enough *light output* for a *long* "Black-to-White Range."

3. **CBS-HYTRON MIRROR-BACK TUBES** produce up to *twice the light output* of ordinary picture tubes. Like the silver backing on a mirror, the *shiny* aluminum backing on a Mirror-Back tube reflects to the viewer *all the light* on the screen. The resulting increased brightness and reduced halation (unwanted spreading of light from one dot to another) is *essential* to give you a *long* "Black-to-White Range." The full range you *must* have for the clearest, sharpest, brightest pictures that are a joy to watch.

TALK LONG "BLACK-TO-WHITE RANGE" PICTURES ...SELL BIGGER-PROFIT

CBS-HYTRON MIRROR-BACK PICTURE TUBES

Talk . . . demonstrate . . . and sell "Long-Black-to-White-Range" clearer, sharper, brighter pictures. It's easier to sell premium-grade, brand-new CBS-Hytron Mirror-Backs . . . with their controlled quality and dependable full-year guarantee. Profit more. Tie in with POST. Get this Mirror-Back Promotion Kit . . . from your CBS-Hytron distributor, or mail coupon.



CBS HYTRON

CBS-HYTRON Main Office: Danvers, Massachusetts

A Division of Columbia Broadcasting System, Inc.

A member of the CBS family: CBS Radio
CBS Television • Columbia Records, Inc.
CBS Laboratories • CBS-Columbia • CBS International • and CBS-Hytron

CBS-HYTRON, Danvers, Mass.

I want all the material to identify me as a *Certified* Quality Service dealer who sells Mirror-Back tubes. Please rush me CBS-Hytron Mirror-Back Promotion Kit containing:

1. 22 x 28-inch Advertised-in-POST window poster.
2. 25 consumer self-mailers, "How *You* Can Have Clearer, Sharper, Brighter TV Pictures."
3. *Certified* Quality Service decalcomania.

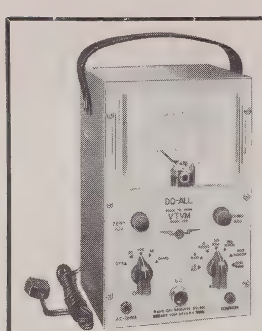
I enclose 25¢ for postage and handling.

I want . . . . . . more consumer self-mailers at 1¢ each, for which I enclose an additional $. . . . .

Name . . . .
(please print)

Street . . . .

City . . . . *State* . . . .



Peak-to-Peak Vtvm "DO-ALL"

Model 655

. . . gives a true reading measurement of complex and sinusoidal voltages with necessary peak-to-peak or RMS value read directly, for the analysis of waveforms in video, sync and deflection circuits. Industrially useful in the service of vibrator power supplies, AC generators and all equipment utilizing any type of waveform or DC.

FEATURES:

- PEAK-TO-PEAK AC measurements of from .2 V to 4200 V on 7 ranges.
- AC RMS measurements of .1 V to 1500 V on 7 ranges.
- DC measurements of from .02 V to 1500 V on 7 ranges.
- RESISTANCE measurements of from .2 ohms to 1000 Megohms on 7 ranges.

Only $59.50 net

- HVMP-2 High Voltage Multiplier Probe extends range to 30,000 volts . . . $8.95 net.

Signal, Marker, Pattern Generator for UHF and VHF—

Completely covered in one instrument—

"DO-ALL" Model 750

Versatile in concept, the RCP Model 750 can check and test alignment of front ends, IF's, sound and pix traps, linearty, syncs, sweeps, positioning, focus and deflection.

FEATURES:

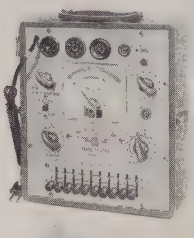
- Inductuner insures accuracy of within ½ or 1% over the entire range of 9 Mc to 900 Mc.
- All VHF frequencies are on fundamentals.
- RF's and IF's are clearly calibrated on a large etched aluminum dial.
- Steady horizontal bars, vertical bars and crosshatch pattern individually produced on all channels.

Only $79.50 net

Tube Tester Meets All Today's Needs, Plus Tomorrow's Color Requirements

PORTABLE TUBE TESTER

MODEL 327P **Only $51.95 net**



Greatest testing performance ever built into a compact instrument. Tests all tubes in current radio and television receivers, as well as in color TV receivers; checks transmitting, hearing aids, ballasts, gaseous rectifiers, and tuning indicators.

A streamline approach to tube test charts allows for simple and speedy operation and permits easy, rapid addition of new tube test data. Data is also given on current color TV tubes.

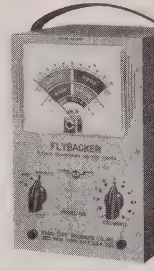
Checks CR picture tubes, both black and white and color, with CR adapter cable (available at slight additional cost). Black and white picture tubes can readily be reactivated with this tester.

select
RCP...
for best
test
performance

modern
designs
to
maintain
modern
circuits

For Fast, Reliable Testing of Flyback Transformers and Yokes

ORIGINAL RCP FLYBACKER



Extremely sensitive, the Model 123 Flybacker immediately shows up a single shorted turn in a flyback transformer or yoke. Its light, portable design serves to advantage in the shop and in the home. All tests can be carried out with the components in place in the TV receiver.

Features: Three Good-Bad Scales—One Scale for Yokes—Tests Low and High Impedance Yokes—Pilot Light illuminates meter when "on."

Only RCP makes the Flybacker — Accept no substitutes!

Only $39.75 net

See Your Local Parts Distributor or WRITE DEPT. S-9 FOR LATEST RCP CATALOG

RADIO CITY PRODUCTS COMPANY
EASTON, PENNSYLVANIA

LOOK! 104 TV tuner parts at your fingertips!

One Trimmer Kit
One I. F. Trap
The Standard Tuner
1011
CONTENTS
IN TV IT'S STANDARD
Standard
One Fine Tuning
One I.F. Coil
One Contact Plate
One Coil Support
Standard Coil Products

THE STANDARD TUNER
(not included in kit)

Use the handy, all-new

STANDARD Tuner Replacement Parts Kit

No. 1011

IN TV IT'S STANDARD

Standard
COIL PRODUCTS CO., INC.
CHICAGO LOS ANGELES BANGOR, MICH.
NO. DIGHTON, MASS.
Export Agent:
Rocke International Corporation, 13 E. 40th St., New York City

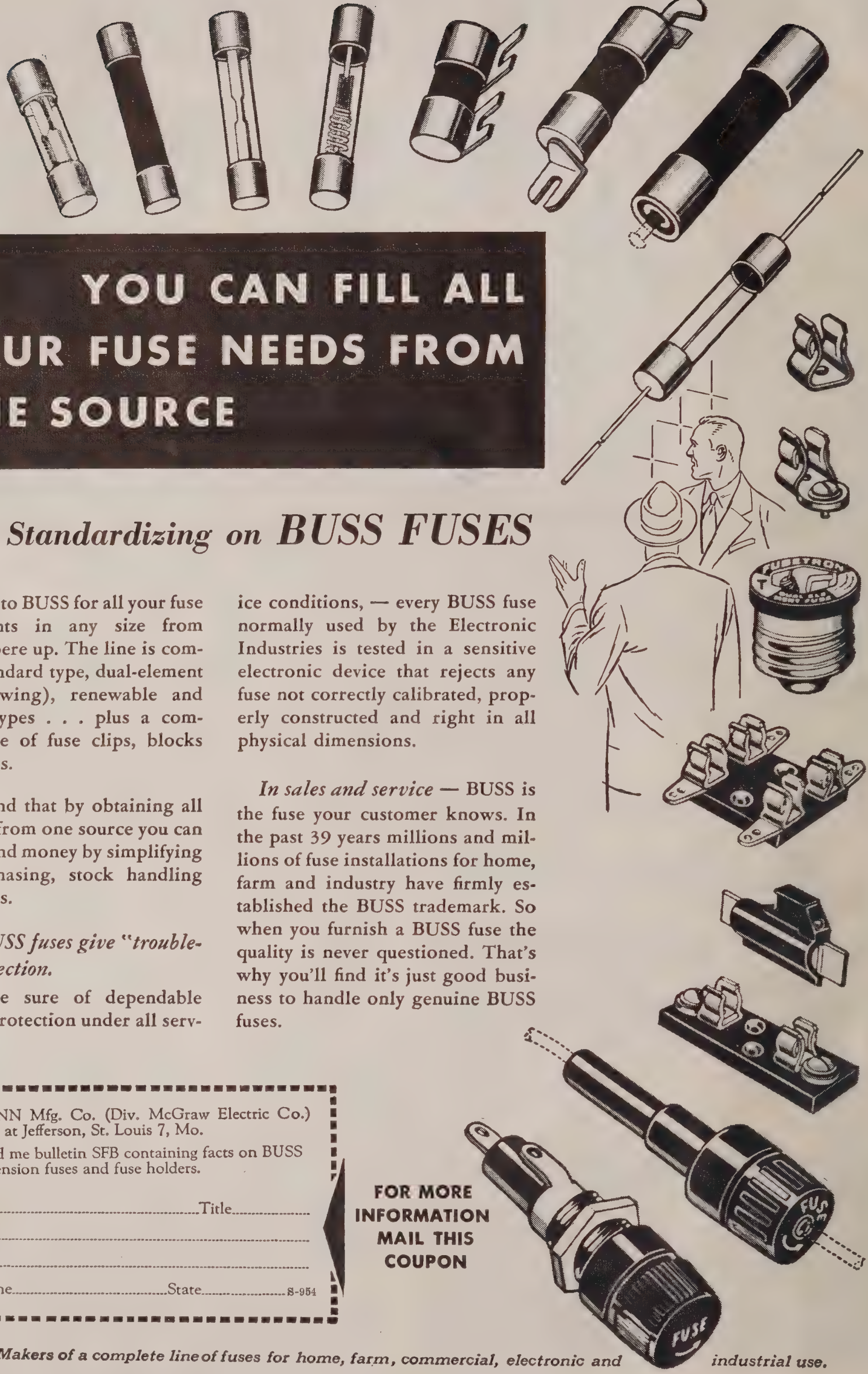
Get your most called for parts servicing Standard tuners series TV-200, TV-1500, TV-2000 and TV-2200. All are now conveniently packaged in this low-cost Standard replacement parts kit—sturdy, compact, fully labeled for quick reference. Each item is individually boxed, except the very small.

More Profit—Kit costs only $22.50, contains parts retailing at $41.30.

Save Time—Hard-to-find tuner parts right at hand for quick, sure selection.

Build Customer Goodwill—Replace tuner parts direct from your Standard kit, so your customer will *know* each part is completely new.

Plan now to speed up your service work, bring new order and efficiency to every job. Get your Standard tuner replacement parts kits today! Call, write or wire your parts jobber, or address Standard Coil Products Co., Inc., 2085 N. Hawthorne Ave., Melrose Park, Ill.



YOU CAN FILL ALL YOUR FUSE NEEDS FROM ONE SOURCE

. . . by Standardizing on BUSS FUSES

Just turn to BUSS for all your fuse requirements in any size from 1/500 ampere up. The line is complete:—standard type, dual-element (slow blowing), renewable and one-time types . . . plus a companion line of fuse clips, blocks and holders.

You'll find that by obtaining all your fuses from one source you can save time and money by simplifying your purchasing, stock handling and records.

Why BUSS fuses give "trouble-free" protection.

To make sure of dependable electrical protection under all service conditions, — every BUSS fuse normally used by the Electronic Industries is tested in a sensitive electronic device that rejects any fuse not correctly calibrated, properly constructed and right in all physical dimensions.

In sales and service — BUSS is the fuse your customer knows. In the past 39 years millions and millions of fuse installations for home, farm and industry have firmly established the BUSS trademark. So when you furnish a BUSS fuse the quality is never questioned. That's why you'll find it's just good business to handle only genuine BUSS fuses.

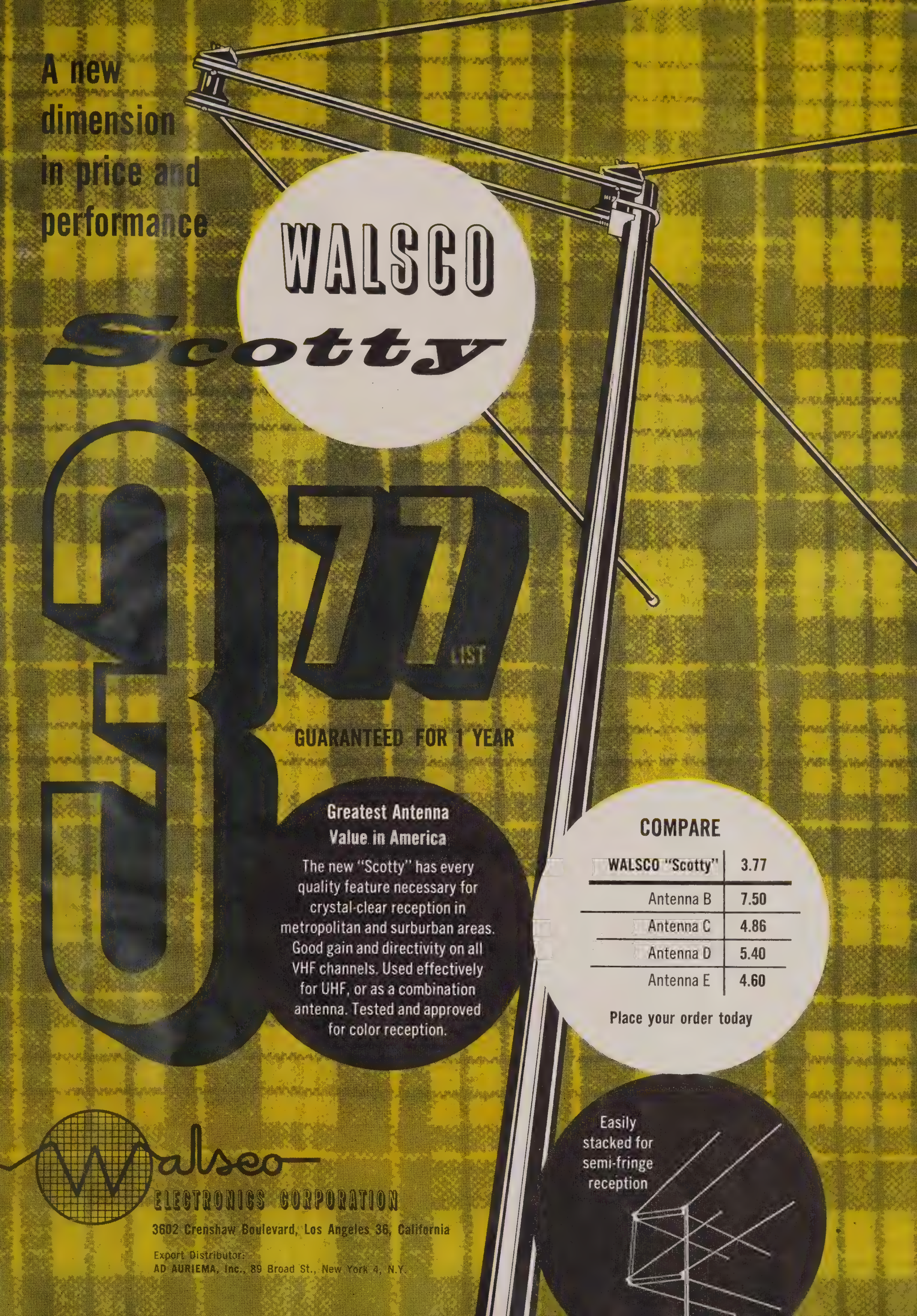
BUSSMANN Mfg. Co. (Div. McGraw Electric Co.)
University at Jefferson, St. Louis 7, Mo.

Please send me bulletin SFB containing facts on BUSS small dimension fuses and fuse holders.

Name...Title....................
Company..
Address..
City & Zone.................................State......................S-954

FOR MORE INFORMATION MAIL THIS COUPON

Makers of a complete line of fuses for home, farm, commercial, electronic and industrial use.



A new dimension in price and performance

WALSCO Scotty

3.77 LIST

GUARANTEED FOR 1 YEAR

Greatest Antenna Value in America

The new "Scotty" has every quality feature necessary for crystal-clear reception in metropolitan and surburban areas. Good gain and directivity on all VHF channels. Used effectively for UHF, or as a combination antenna. Tested and approved for color reception.

COMPARE

WALSCO "Scotty"	3.77
Antenna B	7.50
Antenna C	4.86
Antenna D	5.40
Antenna E	4.60

Place your order today

Easily stacked for semi-fringe reception

Walsco
ELECTRONICS CORPORATION
3602 Crenshaw Boulevard, Los Angeles 36, California

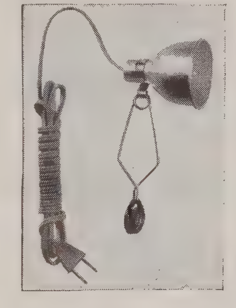
Export Distributor:
AD AURIEMA, Inc., 89 Broad St., New York 4, N.Y.

HERE IT IS . . .

Columbia's

DELUXE

Television Service Lite



Handier than a flashlight . . .

Now . . . with complete swivel for better lighting and easier servicing!

EVERY SERVICEMAN, experimenter, model-maker, needs this handy item. No need to work in the dark . . . ample light is provided by a 7½-watt, 110-volt bulb that remains cool at all times.

Scientifically-designed, unbreakable aluminum reflector directs maximum light to point of work . . . A REAL TIME AND LABOR SAVER.

CARRIED BY LEADING JOBBERS!

Have you seen our other TV service aids . . . "TV Service Cord," "TV Picture Tube Extension Cable," Extension Cords, Hook-Up Wire Assortment, TV Transmission Lines, Etc.

OUR LATEST CATALOG IS AVAILABLE UPON REQUEST!

Columbia WIRE & SUPPLY CO.
2850 Irving Park Road • Chicago 18, Ill.

At Press Time

THE LONG LINES department of A.T.T. has announced that color TV can now be transmitted to 65 cities across the nation.* At present, 145 TV stations in these cities are receiving network TV service and about 95 of them are getting color in addition to black-and-white. It was reported that most of the principal TV routes would be equipped for color by November and by the end of the year it will be possible to transmit color to about 95 cities. . . . WABD in New York has entered the colorcasting circle, transmitting a color-film program once a week. Within a month or so, the schedule will be expanded to include two and later three color shows weekly. . . . NETWORK TV service has been extended into the states of North Dakota, New Hampshire and New Mexico. . . . THE SIXTH ANNUAL MEETING of the Audio Engineering Society, to be held October 14-16, in the Hotel New Yorker, New York, will feature sessions on mikes, phonos, type and disc recording. Specific subjects of some papers are: *Cathode follower circuits applied to a microphone; moving coil feedback disc recorders; transistorized magnetic tape recorders; miniaturized tape recorders; defects in magnetic recording tapes, their causes and cures; speculations on the cause and prevention of needle wear and noise in the phono playback process; twin lever ceramic cartridge; loudspeaker quality control and the consumer; electrostatic speakers; and 3-way systems.* . . . WJTV, channel-25 telecaster in Jackson, Mississippi, has applied for the first FCC satellite permit to operate a slave station to serve the bluff-shielded Vicksburg area, 35 miles away.

---

*The 65 cities that can now receive network color TV programs are: *Ames* and *Davenport*, Ia.; *Atlanta*, Ga.; *Austin, Dallas, Ft. Worth, Houston* and *San Antonio*, Tex.; *Baltimore*, Md.; *Bangor*, Me.; *Birmingham*, Ala.; *South Bend, Bloomington*, and *Indianapolis*, Ind.; *Boston*, Mass.; *Buffalo, Schenectady, Syracuse, New York* and *Utica*, N. Y.; *Peoria* and *Chicago*, Ill.; *Cincinnati, Dayton, Cleveland, Toledo, Columbus* and *Youngstown*, O.; *Denver*, Colo.; *Grand Rapids* and *Detroit*, Mich.; *Los Angeles, San Francisco* and *Fresno*, Calif.; *Hampton, Norfolk* and *Richmond*, Va.; *Harrisburg, Johnstown, Lancaster* and *Philadelphia*, Pa.; *Huntington*, W. Va.; *Hutchinson*, Kans.; *Jackson*, Miss.; *Kansas City* and *St. Louis*, Mo.; *Memphis*, Tenn.; *Louisville*, Ky.; *Milwaukee*, Wisc.; *Minneapolis* and *St. Paul*, Minn.; *Monroe* and *New Orleans*, La.; *Nashville*, Tenn.; *Oklahoma City* and *Tulsa*, Okla.; *Omaha*, Neb.; *Portland*, Ore.; *Providence*, R. I.; *Salt Lake City*, U.; *Seattle*, Wash.; *Washington*, D. C.; *Wilmington*, Del., and *Winston Salem* and *Charlotte*, N. C.

INTERNATIONAL RECTIFIER CORP.

Brings You A Chance to Win A

FREE FORD V-8

Plus 49 Other Big Prizes

• • ● • •

Selenium Diode

Application Contest

• • ● • •

INTERNATIONAL RECTIFIER CORPORATION'S Selenium Diode Application Contest is open to you. Here is a chance to cash in on your ability and ingenuity.

Just illustrate and explain a new application for International Rectifier Corporation's SELENIUM DIODES.

Pick up an official entry blank from your Parts Distributor. He has one or will be glad to get one for you. Have the entry blank countersigned by your Distributor's Salesman and send it to us before January 1, 1955. The entry blank will give you all the rules and information.

Our Judges

DR. LEE de FOREST
United Engineering Labs, L. A.

J. T. CATALDO
Int'l. Rectifier Corp, El Segundo

F. W. PARRISH
Int'l. Rectifier Corp, El Segundo

For Entry Blanks
See Your
PARTS DISTRIBUTOR

Your Ability and "Know-How" Can Win A

FREE FORD FOR YOU!

GET YOUR ENTRY BLANK TODAY!

CONTEST ENDS
JANUARY 1, 1955

INTERNATIONAL RECTIFIER
CORPORATION
EL SEGUNDO CALIFORNIA

THESE INSTRU-MENTS ARE BACKED BY 63 PATENTS

TRIPLETT

proof of 50 year's research

MODEL 630—The "Smoothie"

streamlining expresses advance design features such as selector switch of molded construction, completely enclosed; elimination of harness wiring, etc. AND a single control knob for all 34 ranges affording ease of operation and minimum burn out possibilities.
Price $39.50

MODEL 630A ultra-accurate VOM

designed for the laboratory where you need that PLUS in accuracy—*mirror scales* to eliminate parallax in making readings; ½% *resistors* each mounted in its own insulated compartment; *compensated ohmmeter circuit*, resistance ranges are compensated for greatest accuracy over wide battery voltage variation. Single selector switch feature makes for ease of operation and eliminates possibility of burnouts through incorrect settings.
Price $49.50

TRIPLETT

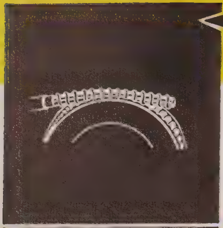
ELECTRICAL INSTRUMENT COMPANY
Bluffton, Ohio

Burton browne advertising

NOW! 2 WAYS TO GET

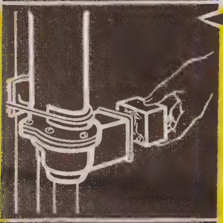
CHANNEL MASTER'S

ROTO-KING



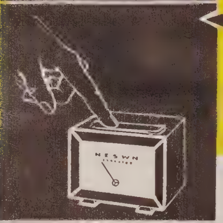
1 **Flexible Worm Gear**

Actually comes in contact with more gear teeth than *straight-bar* worm gear. This means no-slip gear control, no back-lash, no binding; longer life.



2 **Motor Easily Removed**

Motor instantly removed from housing — faster, easier to replace than cartridge types. Lowest servicing cost, because motor is separate from gear train.

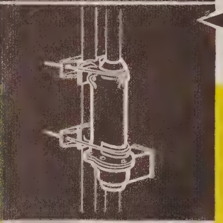


3 **Electrical and Mechanical Stops**

Hair-line accuracy. No over-shooting. No drifting or coasting. Perfect tuning

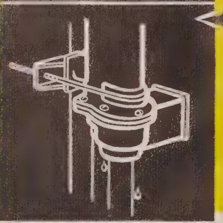
4. **Lightweight — Strong**

All-aluminum die castings, steel reinforced. Built-in guy wire anchors.



5 **Straight-Thru Mast Mounting**

Both rotating and stationary masts go completely through rotor. Grips 12″ section of rotating mast, for greatest resistance to horizontal thrust.

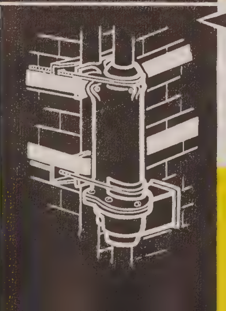


6 **Weatherproof**

Straight-Thru design permits water to drain freely. Weather cannot interfere with performance of rotator.

7. **Extremely High Torque**

Will turn any 4-bay antenna in wind with ease.

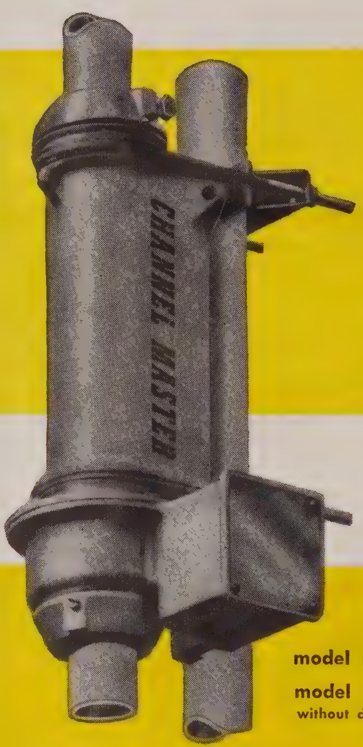


8 **Built-in Chimney Mount**

And — rotor takes up to 1⅝″ mast.

9. **Built-in Thrust Bearing**

3-race ball bearing. Takes heaviest loads without strain.



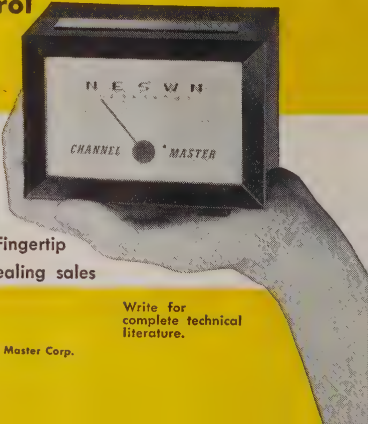
the *new* rotator with these 10 superior features

model no. 9521

model no. 9520
without directional indicator.

10. Midget Control Cabinet

— a beauty!

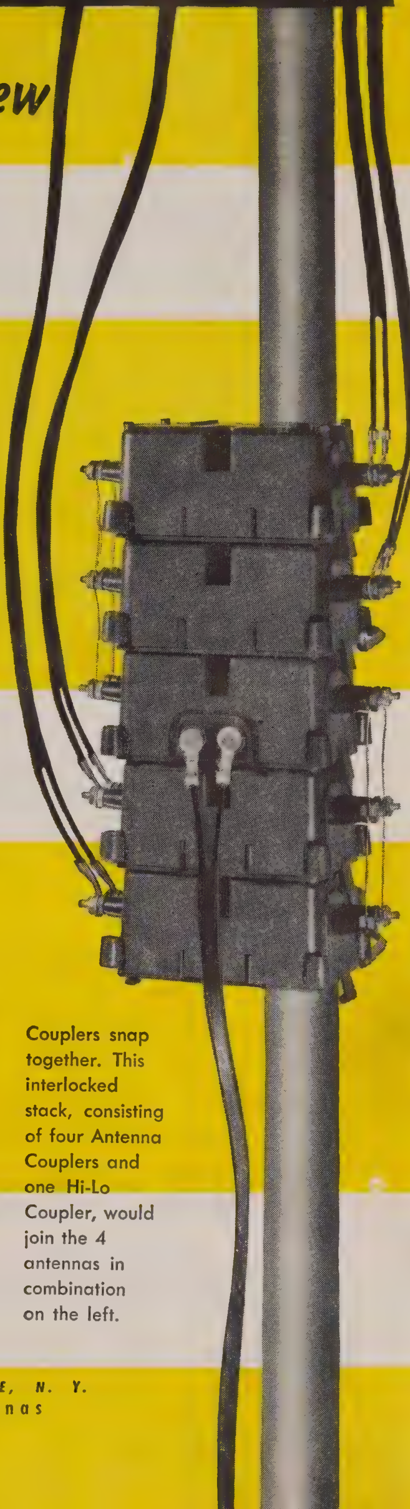


Beautifully styled. Smallest cabinet on the market, only 2¾″ x 4″. Blends harmoniously with any type of home decor. Fingertip control bar. An eye-appealing sales clincher!

Write for complete technical literature.

Copyright 1954, Channel Master Corp.

RECEPTION FROM ALL DIRECTIONS!



CHANNEL MASTER'S *all-new*

SELECTENNA

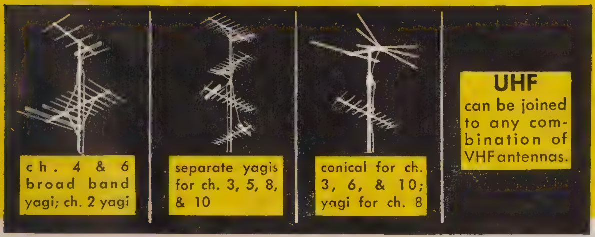
coupling system

A truly revolutionary Channel Master development that permits *unlimited antenna combinations* with only *one* transmission line!

No moving parts — No motors
No switches — Fully automatic!

- For the *first time*, you can tie together any combination of antennas, including separate antennas operating on the SAME BAND.
- Ideal for areas currently using rotators, manually-operated selector switches, and "omni-directional" antennas.
- System is installed quickly, economically — one filter needed for each channel. UHF easily added.

TYPICAL COMBINATIONS — *never before possible!*
Only one down-lead to the set.



ch. 4 & 6 broad band yagi; ch. 2 yagi

separate yagis for ch. 3, 5, 8, & 10

conical for ch. 3, 6, & 10; yagi for ch. 8

UHF can be joined to any combination of VHF antennas.

DOES NOT OBSOLETE THE ROTATOR—
but gives the installation man a new approach to an old problem. Choose the system that provides the better answer to each individual installation.

Couplers snap together. This interlocked stack, consisting of four Antenna Couplers and one Hi-Lo Coupler, would join the 4 antennas in combination on the left.

CHANNEL MASTER CORP. ELLENVILLE, N. Y.
World's Largest Manufacturer of TV Antennas

I'D RATHER USE TUNG-SOL TUBES

There's every reason why servicemen feel this way. Tubes they need they can get. Quality is always uniform—always up to set manufacturers' specs. Callbacks are rare. It's more profitable for servicemen to use Tung-Sol Tubes.

TUNG-SOL®
dependable
PICTURE TUBES

TUNG-SOL 50 YEARS 1904 1954 ACHIEVEMENT

TUNG-SOL ELECTRIC INC., Newark 4, N. J.
Sales Offices: Atlanta, Chicago, Columbus, Culver City (Los Angeles), Dallas, Denver, Detroit, Newark, Seattle.

Catalogs and Bulletins

Duotone, Inc., Keyport, N. J., has published a 40-page needle-replacement catalog-guide, *554,* with detailed cross reference to over 400 cartridges, indicating the replacement needle to use regardless of make of phono or cartridge. Included are photos of practically every cartridge and needle made, with a tabulated manufacturer's index listing phono models and cartridges and needles required. Also shown is a comprehensive table of all types of needles and their model numbers.

* * *

Chicago Division, Chicago Standard Transformer Corp., 3501 Addison St., Chicago 18, Ill., has released a 32-page catalog, *CT-554,* listing stock transformers. Over 500 types are detailed, covering hermetically-sealed, general replacement and control and power circuit transformers, as well as broadcast hi-fi, miniature audio and ultra-miniature units.

* * *

The Astatic Corp., Conneaut, Ohio, has issued a catalog describing phono pickups and needles, recording heads, microphone stands, TV receiver *uhf* converters and boosters.

* * *

International Rectifier Corp., 1521 E. Grand Ave., El Segundo, Calif., has prepared a 4-page bulletin, *GD-1A,* listing ratings and specifications of germanium diodes. Included is a replacement guide for replacing RETMA type diodes.

* * *

Electro-Voice, Inc., Buchanan, Mich., has released a condensed catalog, *119,* covering its complete line. Described are microphones for TV, broadcasting, *pa,* paging, recording and communications; hi-fi speakers, components, enclosures, and 2, 3 and 4-way reproducing systems; phono cartridges for hi-fi and for general record-player replacement; *pa* loudspeaker systems; *uhf, vhf,* and FM boosters, and electronic products.

* * *

Sarkes Tarzian, Inc., Rectifier Division, 415 N. College Ave., Bloomington, Ind., has published a 24-page selenium rectifier replacement guide. Detailed are circuits that can be used to modernize TV receivers by converting to plug-in seleniums, and transformerless power supply circuits for photoflash equipment. Also contains a cross-reference guide for radio-TV and power-type rectifiers.

* * *

Jensen Manufacturing Co., 6601 S. Laramie Ave., Chicago 38, Ill., has released catalog *1040,* and two data sheets, *164* and *165.* Catalog covers line of general purpose and commercial sound loudspeakers, as well as accessory cabinets, volume controls and transformers. Data sheet *164* describes drive-in theatre speaker line, and *165* lists latest hi-fi equipment.

* * *

WCEMA, 339 R. Robertson Blvd., Beverly Hills, Calif., has issued the sixth edition of a product list and membership roster of the West Coast Electronic Manufacturers Association. Contains 44 pages of data and photos of West Coast electronic plants, personnel of each company, manufacturing facilities, and products manufactured by 164 member firms.

* * *

International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa., has released a resistor engineering guide, listing over 130 types of resistors and special products now being manufactured.

On Book Row

Specialized Auto Radio Manuals . . . By Rider Staff: A series of circuit texts devoted to factory-installed auto radio receivers produced between '50-'54. Volumes detail factory-installed sets produced by Ford and by General Motors. Volume *1-A* covers chassis in Ford, Lincoln and Mercury cars; volume *2-A* contains data on Buick, Cadillac and Oldsmobile cars; and volume *3-A* is devoted to receivers installed in Chevrolet and Pontiac cars, and in Chevrolet and GMC trucks. Data includes instructions on noise suppression, installation, and removal, plus schematics, tube layouts, voltages, alignment, dial stringing, trimmer locations, chassis views, parts list, and pictures of receiver housings.—*1-A, 208 pages, priced at $3.00; 2-A, 200 pages, $3.00; 3-A, 128 pages, $1.80; all 8½" x 11", paper bound; John F. Rider, Publisher, Inc., 480 Canal St., New York 13, N. Y.*

* * *

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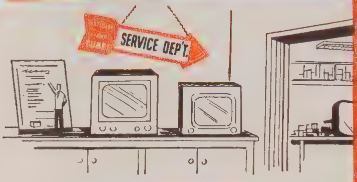
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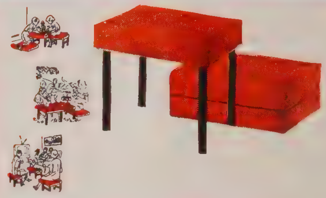

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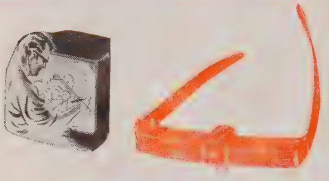

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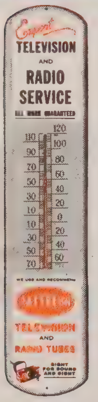
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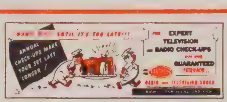
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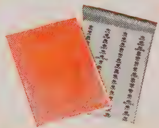

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Rampant Miracles

EVERY INDUSTRY is plagued by schools of mischievous hucksters who spout wondrous claims for a parade of worthless products. But no industry has been so constantly beset by as large a family of chronic, irresponsible meddlers as the TV industry.

Even though a number of government and civic agencies have made repeated attempts to stamp out these blue-sky merchants, many still exist and are as irksome as ever. And it is the Service Man who is hit hardest by the scurrilous activities of this clan. For it is he, serving as the technical specialist in his community, who must be able to explain carefully why a gimmick, that has been lavishly promoted might have little merit. All too often Service Men have found that the cagey, sly sales pitch of these opportunists can be quite convincing and sincere critical advice will be discounted.

In the early days of TV, razzle-dazzle promotion was widespread and tied to a host of items, but particularly the antenna. It was the antenna that offered the best avenue for sales and unfortunately became a victim of deceptive practices.

Then it was claimed that outdoor antennas were nonsense; in fact some had the courage to say that built-in models were completely as satisfactory as the rooftop jobs. That premise did not hold too long; but unfortunately many invested bags of dollars for the pallid idea.

For some time after this wierd experience, a calm obtained on the antenna front. But with the advent of the supersensitive chassis, featuring improved tuners, multi-element tubes and extremely effective hold circuits, which charged the sets with remarkable gain and signal control, the time appeared ripe again for the wonder peddlers to rise and rise they did with a barrage of announcements that startled even the hardiest. Now, industry was told that watch-size antennas were available for these new receivers; and they would not only last forever, but . . . "perform as well as specially-engineered roof antennas."

Here, we were told too, was a . . . "sensational development . . . that . . . even a child could install . . . in 45 seconds!"

Even leading department stores were struck with the gimmick fever and began beating the drum for the tiny "wonder." Some ad men pulled out all the stops with claims that these new gems would eliminate snow and ghosts, improve reception in fringe areas, reduce static and produce clearer and sharper pictures.

Thousands and thousands soon found that these so-called wonders were nothing more than trouble makers, causing about everything that they were supposed to eliminate.

The questionable claims so aroused the National Better Business Bureau that they decided to investigate and samples of several types were sent on to an independent lab. Inspecting the construction of these antennas, the lab experts found that they consisted essentially of about eight feet of copper wire with a connecting lug attached to one end and plastic box, disc or capacitor to the other. One of the plastic boxes contained an *rf* choke embedded in wax. The other contained about a square inch of copper screening embedded in modeling clay.

Testing each of the miniatures for performance, in comparison with a conventional indoor V dipole and an outdoor dipole roof antenna, the lab found that the gimmicks picked up signals, but with an *increase* in *snow*. In addition, it was said, the pictures received on the samples were not as clear as those received with the conventional indoor and outdoor antennas. And none of the miniature models tested was significantly effective in the elimination of ghosts or in the reduction of static interference.

Actually, the lab said, none of the small antennas was any more useful or effective as a receiving antenna than an equal length of plain stranded copper wire. And testing with and without the end attachment, included on the baby antennas, revealed that in no case was the end attachment of any use or value in improving reception.

It was true, said the lab, that the antennas did pick up signals, *but* they did not outperform or perform as well as either the outdoor roof or indoor models used in the tests.

With the truth so firmly established, everyone hopes that these mystic experts of the antenna world have really learned a lesson, and will now fold their tents and just bury their rampant miracles.—L.W.

Locating and Testing for Shorted, Open, Leaky, High-Resistance and Off-Capacity Capacitors

CAPACITOR

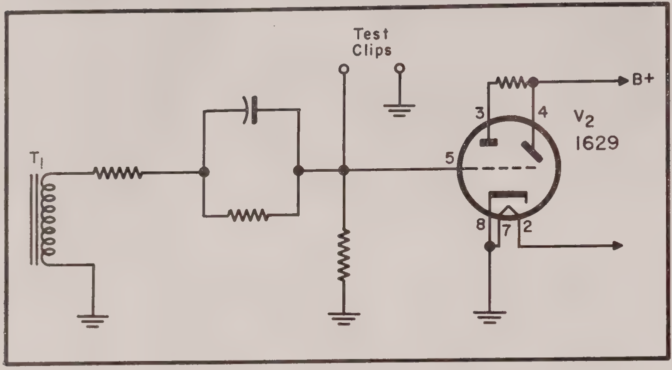

Fig. 1. Schematic of the short test **circuit used in the Sprague** Kwik-Test **instrument.**

With the number of different capacitors used in a variety of applications in modern electronic equipment, Service Men find it increasingly difficult to locate and properly evaluate those which might be causing trouble.

While capacitors are manufactured to many different specifications they have two basic properties upon which all applications are based: (*1*) To block *dc,* and (*2*) to *pass ac.*

Because of the dielectric or insulating material between the plates the first is obvious. The second involves the use of the word *pass* rather loosely. While, to all practical purposes, there is no actual electron flow *through* the dielectric, the capacitor, with *ac* voltage applied, will charge and discharge in either direction according to the magnitude and frequency of the applied voltage. This results in a continuous flow of alternating current in the circuit, diminished only by the reactance or impedance of the capacitor. This reactance is less as either the capacitance is larger or the frequency higher.

The complete or partial failure of a capacitor to meet either of these requirements, in a particular circuit results in trouble. This failure can be one of five basic types: (*1*) Short circuit, (*2*) open circuit, (*3*) leaky, (*4*) high resistance, or (*5*) off capacity.

Each is a separate condition, but combinations of these can result in apparently different types. They also can be considered as being of two separate classes.

Shorts and *opens* indicate a condition where a capacitor has ceased to be a capacitor at all. This class of defect is known as qualitative since it requires the evaluation of a part as a *capacitor* or *no capacitor.* The remaining three types are descriptive of parts which, electrically, are still capacitors but deviate from a prescribed set of mathematical values governing their function in the circuit. These are known as quantitative conditions since they require the measurement of the capacitor properties in appropriate electrical units.

Shorted Capacitors

In locating, and testing for, shorted capacitors little regard need be given to the properties of the capacitor itself. As pointed out this condition is simply a short circuit. In other words, it is no longer a capacitor.

A circuit[1] designed to show up a short while all components are still in the circuit, is shown in Fig. 1. With the proper bias furnished by transformer T_1 the *eye* of the 1629 will close. With a short across the test clips the bias voltage is lost and the *eye* remains open. Because the circuit is sensitive only to low resistance values this will, for example, detect a shorted buffer capacitor across the secondary of a vibrator transformer. Were the capacitor not shorted the 20 ohms or so resistance of the transformer secondary would not be low enough to cause the eye to remain open. Since this is a *short* test rather than a capacitor test it may be applied to many kinds of short-circuit conditions.

Now, what is the effect on the circuit when a capacitor becomes a short? Bypass and coupling capacitors cause a complete loss of tube voltages sometimes by means of a direct short across the power supply, or in low-voltage *rf* circuits cause loss of signal. In some cases the short may be of the intermittent variety, causing periodic shorts under particular physical or electrical conditions. In testing for shorts, it is always a good idea to tap or *jiggle* the capacitor and note any flicker of the indicator. The circuit in Fig. 1 offers an effective way to detect an intermittent short.

Open Capacitors

Open capacitors represent another condition that is a basic circuit problem. An open capacitor will show *zero* capacitance on a bridge measurement, indicating the complete lack of capacitance. To get an indication of this condition when the capacitor is in combination with other parts, the circuit shown in Fig. *2* is used. The test cable T_2 and impedance Z_1 constitute a quarter-wave transmission line operating at a frequency of approximately 20 mc. If the line is terminated in a high impedance, such as an open capacitor, a coil, or a resistance above 20 ohms the input end of the line is, in effect, a short circuit causing the *eye* of the 1629 to remain open.

This method of locating the open capacitor when it is still in the circuit is quite desirable, since normal *dc* voltages might not be changed if the capacitor becomes open. As in testing for shorts, the capacitor section may be a connection which has broken but makes periodic contact. Moving the capacitor body with lead wires anchored to test clips will often cause this condition to show itself.

Leaky Capacitors

As a result of physical or chemical changes within or around it a capacitor can develop an abnormally low value of *dc* resistance. It follows that it may then permit an excessive amount of *dc* to pass.

It may seem that there is a relation between a shorted capacitor and a leaky one (taking the extreme case of total *dc* leakage), but since we are concerned with *capacitors* we must make the distinction. Leaky or low-resistance capacitors are still capacitors and require a quantitative type of measurement. Furthermore, the amount of permissible leakage varies with the type of capacitor and its circuit requirements. As an example, we can readily see that the amount of permissible *dc* leakage current is far

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[1] *Used in Sprague KT-1 Kwik-Test.*

Troubleshooting

by **JOHN N. MACDONALD**

Sprague Products Company

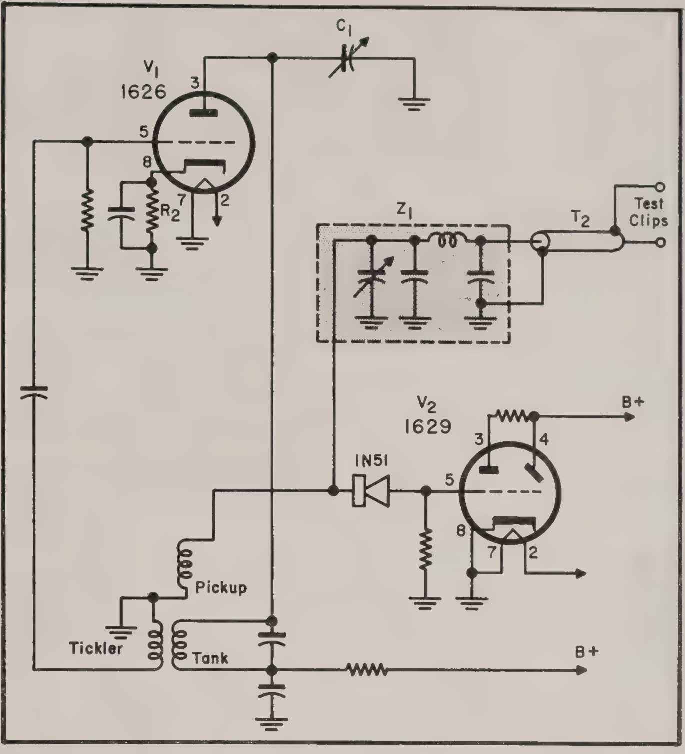


Fig. 2 (above). Circuitry used in Kwik-Test for open-test checks.

greater for a cathode bypass electrolytic, than for a paper capacitor used for interstage coupling.

Measurements on suspected units must be made out of the circuit and in two different manners.

The first approach is applied to electrolytics and is simply the measurement of *dc* passed with rated voltage applied. Since various type dielectric materials have finite values of resistance there is some leakage current for each microfarad of capacitance. As additional microfarads are added in parallel the resistance is lowered and greater amounts of current may be passed. Electrolytic capacitors, by virtue of their high capacitance, normally have values of leakage current which may be easily measured. By applying the rated *dc* voltage to an electrolytic the leakage current can be read directly on a *dc* milliammeter. The evaluation of the results must take into consideration the capacitance and voltage rating. This is usually computed by a formula such as the following:

$$I = (K \times C) + 0.3$$

Where: I = Maximum allowable leakage current

C = Capacitance in microfarads

K = Constant depending on voltage rating of capacitor as noted below in Table 1.

Rated DC Voltage	K
3 to 100	.01
101 to 250	.02
251 to 350	.025
351 to 500	.04

Table 1

Maximum allowable leakage current for a 25-mfd 50 *v dc* unit would be:

$$(.01 \times 25) + 0.3 = .55 \text{ ma}$$

Maximum allowable leakage current for a 10-mfd 450 *v dc* unit would be:

$$(.04 \times 10) + 0.3 = .7 \text{ ma}$$

Other types of capacitors such as paper, ceramic, or mica are made to much lower capacitance values and the voltages applied to them in the circuit are quite varied. For these types it becomes more practical to measure the *dc* resistance of the unit; this is known as the insulation re-

(*Continued on page* 75)

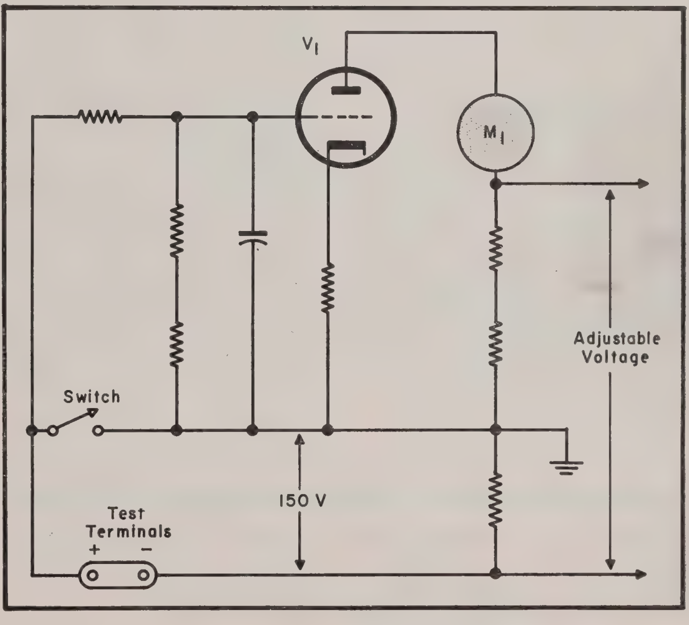
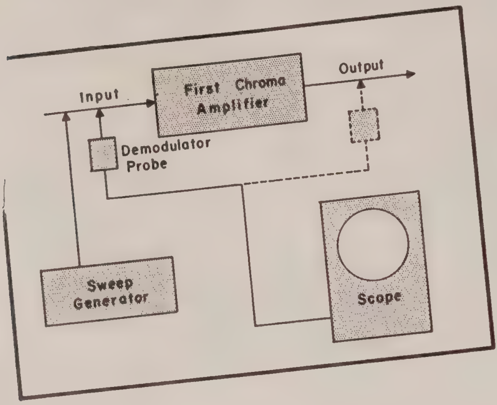


Fig. 3 (right). Insulation-resistance measurement circuit used in another test unit, the Sprague Tel-Ohmike.

Fig. 1. The gain of the first chroma amplifier should be checked by applying a video sweep signal to the input of the amplifier, and checking the input voltage first, and then the output voltage, as indicated. The ratio of the two deflections on the 'scope screen represent the gain of the amplifier.



COLOR TV
Video Sweep Checks

by **ROBERT G. MIDDLETON**[*]

[*] *Field Engineer, Simpson Electric Company*

Techniques Developed to Make Gain Checks With 'Scope and Suitable Signal Source

In color TV servicing video-frequency sweep checks are particularly important.

Such checks can be made either with an *rf* or *if* sweep and marker generator, when provided with a probe[‡], or they can be made with a specialized video-frequency sweep generator.

The video signal circuits in a typical color TV receiver are the first and second chroma amplifiers; *I* and *Q* demodulators; *Y* and *I* amplifiers; red, blue, and green matrix; red, blue and green video amplifiers. Not all of these video circuits are customarily swept in routine service, but it is instructive to view the gain of each of these circuits via the frequency response curves versus the input voltage level.

Measuring First Chroma Amp Gain

As illustrated in Fig. 1, the gain of the first chrome amplifier is checked by applying a video sweep signal to the input of the amplifier; a demodulator probe is then applied to the input of the amplifier, and the resulting deflection is noted on the 'scope screen. Next, the demodulator probe is applied at the output of the amplifier, and the subsequent deflection on the 'scope screen is compared with the first deflection. This figure gives the gain (or loss) of the first chroma amplifier.

The deflection obtained at the input of the amplifier is shown in Fig. 2, and the deflection obtained at the output of the amplifier appears in the Fig. 3 waveform. It will be noted that, unlike the video amplifier in a monochrome TV receiver, the gain is quite low, being only nine times, approximately, as compared with a typical figure of twenty-five times for a *b-w* receiver. The chrome amplifier is a baandpass amplifier, operating from 2.1 to 4.2 mc; this baandpass response is somewhat more evident in Fig. 4, where the zero-frequency point appears in the center of the display.

Swept Input V Flatness Correction

Inspection of Fig. 2 will reveal that the load imposed by the circuit under test may not always permit the sweep generator to deliver a perfectly flat sweep voltage. This point is clarified in Fig. 5; the waveform at bottom shows a lack of flatness in the sweep input when the color receiver is turned on, while the top view shows the great improvement in flatness when the receiver is turned off. The difference is due to kickback from the delay line, which rings when swept.[1]

Since the sweep flattens out when the receiver is turned off, it is apparent that the sweep-input voltage itself is satisfactorily flat, and hence corrective measures are not required. Service Men must be on guard against such situations. At times one will encounter other situations where the load is unsuitable and will distort the sweep input voltage (with the receiver *off*), and a compensated attenuator arrangement will be desirable to lessen the reactive loading of the sweep-output system. Frequently *dc* voltage is present at a point of sweep input, and hence a suitable blocking capacitor must be used in such cases to avoid damage to the generator output system. The capacitor must be sufficiently large so that the low-frequency response of the swept input is not attenuated, as shown in Fig. 6.

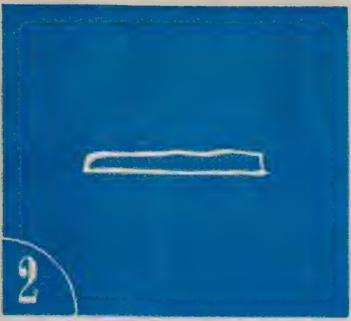
The circuit factors involved in the foregoing situation are shown in Fig. 7. The output cable from the video sweep generator, in this example, is terminated in 75 ohms, which is much lower than the 500-ohm impedance of the contrast control, across which the video sweep voltage is applied. But since there is *dc* bias voltage developed across the contrast control, a blocking capacitor, *C*, is required. The reactance of this capacitor should be no greater than .1 of the impedance of the contrast control, or 50 ohms; at 50 kc (the lowest sweep frequency of importance), a capacitance of .05 mfd develops a reactance of 65 ohms, and a capacitor of .1 mfd develops a reactance of 30 ohms. It is advisable to use the .1-mfd capacitor.

The output from a video sweep generator does not always have uniform flatness on either side of zero frequency, as shown in Fig. 8. Since the

(*Continued on page* 68)

[‡] Such as the *Simpson Chromatic Probe.*

[1] *Delay-line ringing* will be analyzed in detail in a subsequent article.



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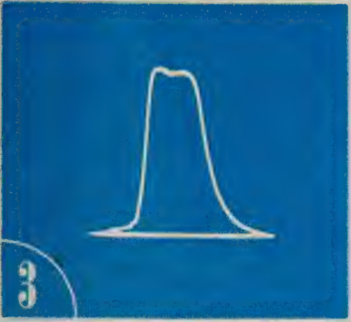

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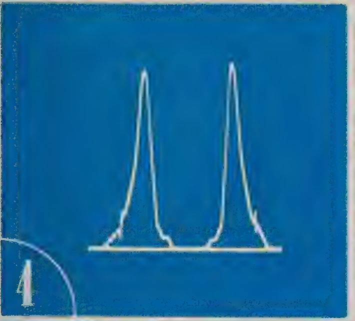

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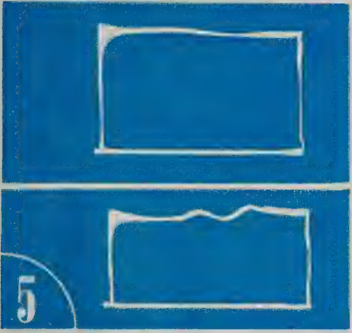

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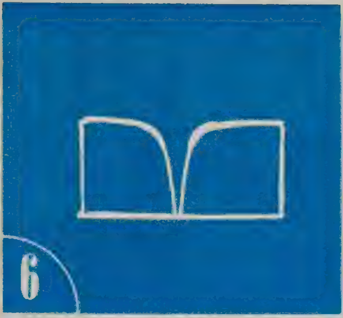
Figs 2, 3, 4 and 5. Deflection obtained at input of first chroma amplifier appears in Fig. 2. This is not a perfectly flat sweep, and one should endeavor to correct the swept trace, as explained in the text. Deflection obtained at output of first chroma amplifier is shown in Fig. 3. The gain is seen to be approximately nine times. Fig. 4 is a photo of the response obtained at the output of the first chroma amplifier, to show bandpass characteristic of the circuit when the zero-frequency point is centered in the display. Fig. 5. Top photo shows flatness of video-frequency sweep voltage as tested with demodulator probe across contrast control, receiver off. Bottom view illustrates loss of flatness when receiver is turned on.



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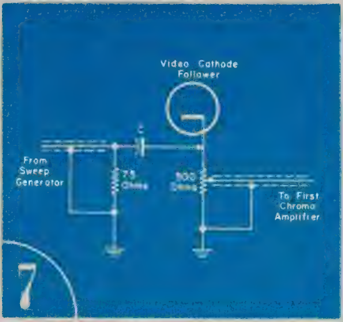

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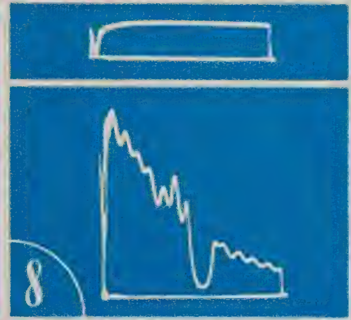

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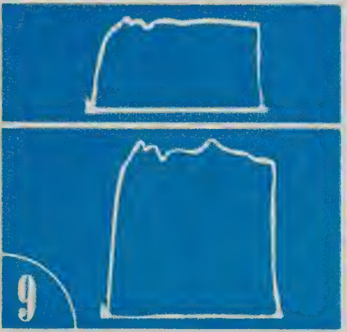

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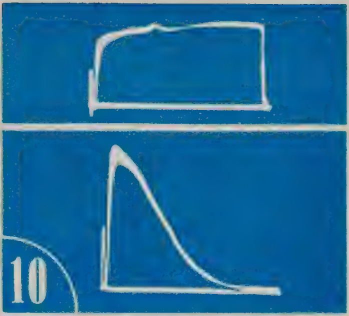
Figs. 6, 7, 8 and 9. Loss of flatness of video-frequency sweep due to use of blocking capacitor having too small a value is illustrated in Fig. 6; zero frequency appears in the middle of the pattern. To avoid attenuation of the low video sweep frequencies blocking capacitor must be about .1 mfd, as diagramed in Fig. 7. Fig. 8. Gain of the Y amplifier can be found by applying the video sweep voltage at input of amplifier, and testing the input voltage and the output voltage with a demodulator probe and 'scope, as shown in these waveforms. Fig. 9 shows gain check waveforms for the second chroma amplifier.



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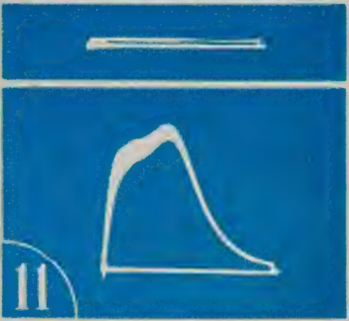

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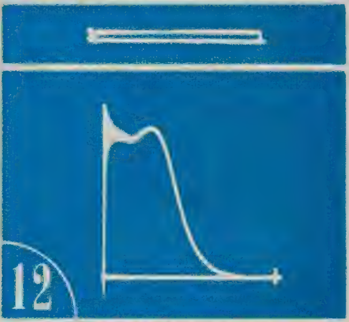

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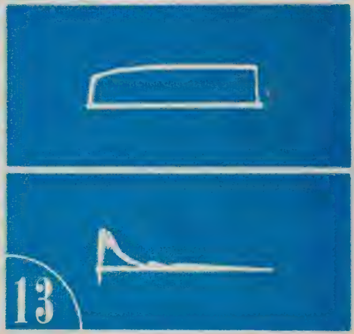

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Figs. 10, 11, 12 and 13. Four gain-check waveforms are shown here. In Fig. 10 we have gain check results obtained in I demodulator circuit. Fig. 11 shows gain check of Q demodulator. Gain check of the I amplifier appears in Fig. 12 and in Fig. 13 is the gain check of the red matrix.

Author of* ***Color Test Equipment Applications,* *to be published by* ***John F. Rider.***

Reducing

ALLORY
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View of a half-wave annunciator rectifier, assembled and wired for installation.

INTERFERENCE FROM *dc*-operated vibratory annunciators, such as bells and buzzers, can usually be reduced by a factor of more than 10, and often more than 100, by shunting the coil with a capacitor of medium capacity. Use of a shunt capacitor alone causes a great depeaking of the fly-backs from the annunciator coil, and a moderate reduction of the damped oscillations following the flyback.

When greater reduction of the damped oscillations (greater decrement) is desired, a small resistor in series with the capacitor is effective. This increases the over-all resistance of the oscillatory system (coil, capacitor, resistor), and dissipates the flyback and oscillatory currents as heat. *R-C* devices of this general type are commonly used in the wire communications industry, and are described in many engineering handbooks as *spark absorbers*. In general, the same techniques which minimize contact sparking also minimize radio and TV interference from the same device.

Very large electromagnets, such as door latch magnets, solenoids, and the better grades of electrically-operated counters, store so much energy that an effective spark-absorbing capacitor is uneconomically large; and the circuit resistance is so low that damped oscillations following the flyback last for many cycles. In a few instances, the coil may be shunted with a large capacitor up to 20 mfd, for example, to reduce flybacks and oscillations. What is really needed here, however, is not an energy storage device, such as a capacitor, but a *charge dumper*, to dissipate the flyback energy in some form other than *rf*. This is particularly important when a number of devices are operated in parallel from the same line. On opening the circuit, flybacks from one device may travel back along the line, causing unwanted operation, or even destruction, of paralleled devices (such as pilot lamps).

Because the amplitude of a flyback from a large efficient electromagnet is of very much greater amplitude than the operating voltage (a six-volt Veeder-Root counter, for example, has a flyback voltage exceeding 80) the flybacks can be effectively depeaked by shunting a neon bulb across the terminals. This will effectively reduce flyback amplitude to the extinction voltage of the neon bulb, usually about 65 volts.

Further dissipation of flyback energy is possible by use of a reversed diode. This is most effective when *backed up* by a neon bulb, to prevent sparkovers, and a small capacitor, which automatically depeaks the flybacks. Germanium diodes (such as the 1N34) are useful with small coils, but selenium units of higher current capacity, must be used with large electromagnets. Reversed diodes are effective here because the flyback polarity is opposite to the operating polarity, and this circuit property limits the use of reversed diodes to *dc* systems.

The Surge Harbor Circuit

Perhaps the most effective flyback absorber is the *surge harbor* circuit. Here, when the operating current is on, flow is from line to load, the capacitor resistor circuit being isolated by the reverse-connected diode rectifier. When the operating circuit is opened, the magnetic field of the electromagnet collapses, producing a flyback having polarity the reverse of the operating current. This flyback enters the *capacitor* via the rectifier, and is dissipated as heat in the shunt resistor. Damped oscillations in the system are minimized by the valve effect of the rectifier. A slight improvement in operation is possible, in some instances, by inserting a low resistance or a small choke coil in the line on the supply side of the rectifier. This increases the reactance of the supply line greatly, so that the rectifier-capacitor path is the *preferred* one for flybacks. When a nonpolar capacitor (*ac* type) is used, a cancelling charge, opposite in polarity to the flyback, can be placed upon it by shunting the rectifier by a high resistance. Use of this circuit is uneconomical and usually unnecessary in low-power circuits, but is desirable when wattage is measurable in hundreds, or ampere turns in thousands.

System Conversion to DC

When interference from an *ac* annunciator system cannot be reduced to a tolerable value, conversion to *dc* operation should be considered. Many systems, using *universal* components (*ac-dc*) can be so converted quickly, at a relatively low cost. After such conversion, interference can be still further reduced by use of flyback absorbers. Conversion to *dc* usually improves the operation of *universal* annunciators and solenoids, at the same time reducing the audible noise (60 and 120-cycle hum) from them.

Required for conversion from *ac* to *dc* operation, is a rectifier and filter. Three fairly standard circuits are shown in Fig. 1. Fig. 1*A* shows a half-wave system, which is cheapest to install. A full-wave system, requiring a tapped transformer, is shown in Fig. 1*B*; and a bridge system, using a standard two-terminal secondary, but supplying full-wave rectifier output, is shown in Fig. 1*C*. Component ratings are so chosen that a very large factor of safety is present, and component life, in consequence, can be very long; more than five years in many instances.

Construction of annunciator-system rectifiers is simple, and requires only a small amount of labor, as standard

---

*A report on types of annunciator-interference and assorted waveforms produced by annunciator signals appeared in the April issue of SERVICE.

ANNUNCIATOR TVI*

Use of Charge Dumpers . . . Flyback Depeaking With Shunt Neons . . . Application of Reversed Diodes . . . Conversion to DC to Reduce TVI . . . General Procedure for Reduction of Interference

by RONALD L. IVES

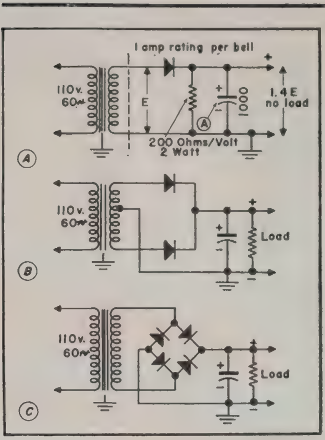

Fig. 1. Three types of rectifier systems for conversion from ac to dc operation: A = half wave; B = full wave; C = bridge.

radio components, available at any distributor, can be used.

No-load voltage of such a rectifier is 1.414 times no load voltage of the transformer, less a small rectifier drop. Because annunciator transformers are customarily designed to have high reactance, and hence poor regulation, the resistance of the rectifier proper is of little importance. The rectifier should be housed in a suitable protective container, such as a standard *utility box,* and lead holes should be grommeted, to prevent insulation fraying and resultant short circuits.

After conversion to *dc* operation, all circuit components should be checked for operation, and readjusted if necessary. Then any further circuit changes necessary to reduce interference can be made.

Partial Conversion to DC

In many annunciator systems, all, or a major part, of the radio and TV interference is caused by one component or by one group of circuits, not by the whole system. Often it is both economical and feasible to convert that part of the system to *dc* operation, leaving the rest of the system, which does not make trouble, *as was.* Any standard rectifier and filter system can be used (Fig. 1), current capacity of the components being determined by the load on the part of the circuit under consideration.

Other Methods

Reduction of radiation from annunciator systems can usually be brought about by running all leads as twisted pair (inexpensive), or by running them in grounded metallic sheaths, such as conduit (very costly). In a few instances, a marked reduction in annunciator interference has been brought about by grounding large metallic objects, such as filing cabinets, steel desks, safes, etc., which are not connected to the annunciator system at all. Metal venetian blinds, and sections of metal lath also cause trouble at times, and ungrounded sections of *bx* cable, added on to an original knob-and-tube wiring job, or one initially wired with Romex (or similar) cable, can act as subsidiary radiators of undesired impulses.

Procedure For Interference Reduction

Reduction of radio and TV interference can sometimes be a very time-consuming and costly process. At other times, the interference can be reduced to a negligible amplitude in a short time with a few very inexpensive components.

In reducing interference the following general steps have been found effective:

(*1*) One should locate source of interference. Customer complaints can be very helpful here. A report such as . . . *every* time someone rings the front door bell, the picture *flops over twice* . . . pinpoints the source effectively. When a specific location is not obvious from the complaint, it may be necessary to sectionalize the house wiring, pulling the fuses on various branch circuits until the trouble stops. To eliminate possible coincidences, the check should be carried one step further, and should show that replacing the fuse in the circuit also starts the trouble again. If the interference source is not under the control of the customer, it may be necessary or desirable to use a directional receiver to locate it.

(*2*) One should determine the path by which the interference reaches the receiver. This may be via the power lines, by direct radiation and antenna pickup, or by direct radiation and pickup by some receiver component. Use of a line filter, as previously outlined, will show whether or not line pickup is important, and if the trouble is line-carried, insertion of a suitable line filter, preferably at the source of the interference, will cure it. If the interference is directly radiated and reaches the receiver via the antenna system, disconnection of the antenna, or shorting the antenna terminals, will reduce it. If the interference is radiated and then picked up by some part of the receiver other than the antenna system or power lines, shielding of the receiver should reduce the trouble. Effective receiver shielding is sometimes quite costly.

(*3*) One should apply remedial measures, starting with the simplest, and as near the source of trouble as possible, until the trouble is eliminated. Observation of the trouble-making signal by use of a 'scope is sometimes most helpful here.

Other Interference Problems

Reduction of interference is not only a technical problem, but also a social problem in many instances, as the source of the interference is often equipment owned and used by someone other than the customer who complains

(*Continued on page* 84)

NEW

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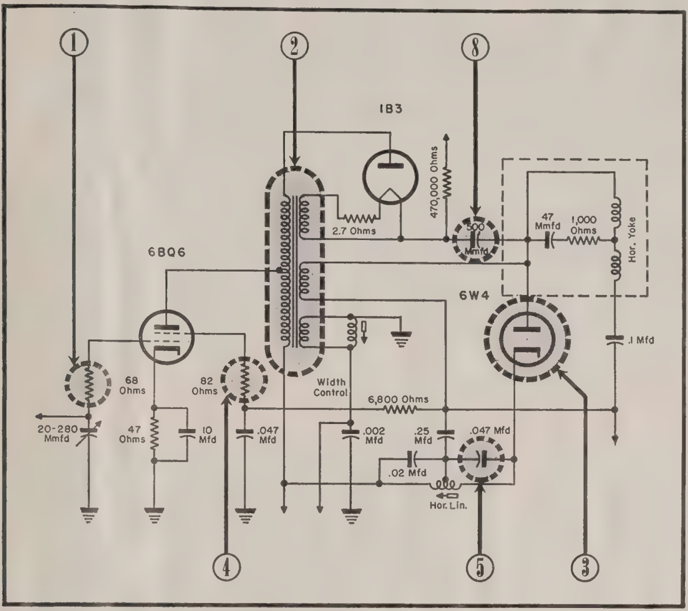
SWEEP CIRCUIT Performance Factors

by CLARK R. ALISEN

Condition	Cause	Control Method
Picture width decreases as horizontal drive is increased. Horizontal-output tube has short life. ***(1)***	Parasitic oscillation in horizontal-output circuit at peak of drive, when grid draws current.	Parasitic-suppression resistor should be inserted in series with grid at terminal of tube socket: **See schematics at right; circle 1.**
Alternate light and dark gray bars in raster at left-hand side of screen. ***(1a)***	Stray reactances of horizontal-output transformer are undamped and are shock-excited into oscillation at a frequency of approximately .5 mc.	Insertion of an anti-ringing filter in series with the horizontal-deflection coils will cure trouble. Filter may consist of a parallel *lcr* arrangement; a 150-microhenry coil, .0068-mfd capacitor and 680-ohm resistor: **See waveform in *(A)*.**
Vertical white bar on left-hand side of screen as horizontal-drive control is advanced. ***(2)***	Saturation of the core in the horizontal-output transformer develops a transient in the current sawtooth of deflection.	Air gap in core of horizontal-deflection transformer must be properly adjusted: **See schematics at right; circle 2.**
Barber-pole interference appears as a vertical bar near the left-hand edge of the picture. ***(3)***	Spook interference is caused by harmonic radiation from the damper circuit beating with the picture signal in the front end.	Damper waveform is sharp-peaked, and has strong harmonics which can be suppressed by insertion of *rf* chokes: **See schematics and waveform at right; circle 3 and *(B)*.**
Black vertical lines(s) at left-hand side of picture. ***(4)***	Failure of horizontal-output tube to cut off completely at beginning of sweep, and undershoot of plate voltage, cause generation of Barkhausen oscillations.	Tube with better cutoff characteristic should be selected. A suitably placed beam-bender magnet should be used on envelope of tube, and a better antenna should be installed for higher signal-to-noise ratio. Suppressor resistors should also be inserted in series with screen and plate leads: **See schematics at right; circle 4.**
Severe foldover and non-linearity in sweep. ***(5)***	Can be caused by an open or partially-open input booster capacitor.	Capacitors should be checked by substitution: **See schematics and waveform at right; circle 5 and *(C)*.**
Column of short horizontal white streaks appear in picture; sync is unstable. ***(5a)***	Parasitic oscillation in horizontal-output tube circuit.	Heater choke and decoupling capacitor in horizontal-output tube circuit should be checked. If necessary, a small screen bypass capacitor should be connected directly at socket terminal.
Vertical bars in raster, with no picture present. Scanning lines bend in passing through the bars. ***(6)***	Cross-coupling between horizontal- and vertical-deflection coils results in shock excitation of vertical coils on each horizontal sweep.	Value of balancing capacitor should be adjusted correctly: **See schematic at right: circle *(6)*.**
AM broadcast interference, consisting of birdies in AM receiver at each 15.75-kc interval across dial. ***(6a)***	Normal horizontal-sweep waveform is sharp pointed and radiates harmonics in the AM broadcast range.	Better antenna should be used for higher signal-to-noise ratio in broadcast receiver. Sweep leads should be enclosed in loose-fitting tubular shield. Chassis of TV receiver should be grounded to water pipe. Line filters should be used at both TV and AM receivers: **See waveform in *(D)*.**
Vertical ripple bars in raster; scanning lines do not bend in passing through bars. ***(7)***	Excessive ripple voltage in high-voltage power-supply output.	An *RC* filter should be installed in high-voltage output lead, if not provided, or capacitor should be checked if filter is present: **See schematic at right; circle *(7)*.**
Foldover encountered when high-voltage filter capacitor is returned to plate of damper tube. ***(8)***	The increased high voltage and increased picture brightness are obtained at the expense of increased shunt capacitance across the secondary of the transformer, which slows down flyback.	High-voltage filter capacitor should be returned to ground: **See schematics at right; circle (8).**


①
②
⑧
1B3
470,000 Ohms
2.7 Ohms
6BQ6
47 Mmfd
1,000 Ohms
Hor. Yoke
500 Mmfd
6W4
.1 Mfd
68 Ohms
82 Ohms
Width Control
6,800 Ohms
20-280 Mmfd
47 Ohms
10 Mfd
.047 Mfd
.002 Mfd
.25 Mfd
.047 Mfd
.02 Mfd
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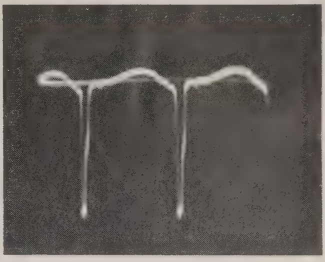
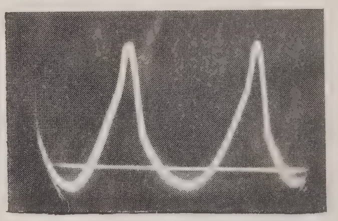
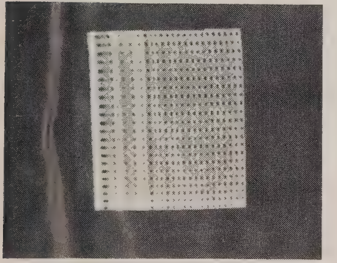


(A)
Above: When ringing is severe, it can be seen in the voltage waveform, taken across the horizontal-deflection coils, as illustrated here.

(B)
Below: Voltage waveform in damper circuit exhibits a sharp peak, which generates strong harmonics that may cause spook interference.

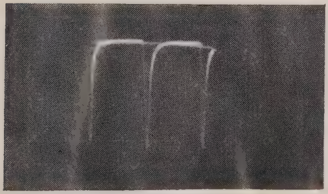


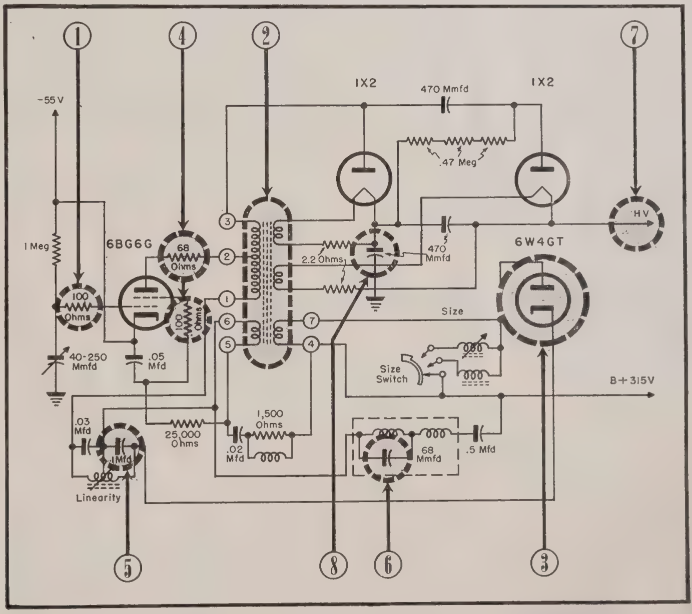
[Above (left) and below (right)]
Figs. 1 and 2. Schematics of typical sweep systems. Circled areas, where trouble might appear, are analyzed in chart at left.
(Courtesy Ram Electronics)

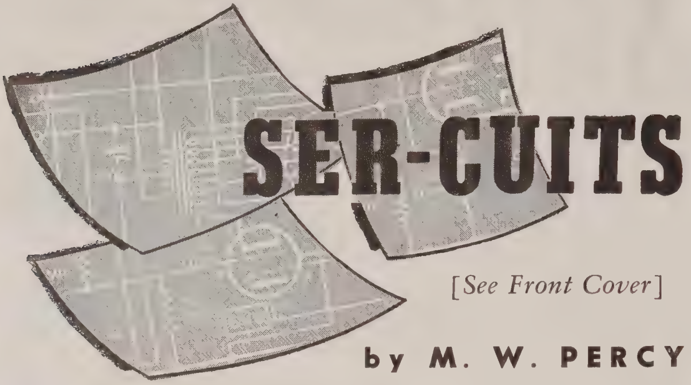


(C)
Above: Foldover due to open input booster capacitor, as displayed, using a dot-pattern generator.

(D)
Below: Normal voltage waveform across horizontal-deflection coils has sharp points, and may radiate strongly in the AM broadcast band







SER-CUITS

[*See Front Cover*]

by M. W. PERCY

THE INCREASING interest in *uhf* has prompted the development of a variety of basic and auxiliary equipment for reception. In the main, it has been difficult to evaluate the performance of this apparatus, except in a general way with on-the-air comparison tests. Such tests have limitations because the results are dependent upon local conditions, as well as auxiliary equipment.

The problem, it was felt, could be solved with an instrument that would measure gain, and in addition, provide a reliable signal source in the *uhf* range. With this situation in mind, one lab began studying design possibilities of the necessary gear. Their survey resulted in the development of the generator shown on the cover and in Fig. 1[1].

The generator employs a center-loaded cavity as the tuning element in a modified Colpitts oscillator circuit. This method has been found to offer many advantages over Lecher lines and lumped *L/C* constants.

To illustrate, in this arrangement, there are no wiping contacts which could introduce *noise,* and affect the *Q* of the circuit, since the contacts represent a series resistance. External radiation which can invalidate measurements has been found to be absent in the cavity, since all fields are confined to the inside surface of the cylinder.

Frequency drift, always a problem at *uhf,* has been held to a minimum through the use of a silvered glass plunger with negligible expansion characteristics at the normal operating temperatures. To minimize frequency drift from line voltage variations, a series voltage regulator has been included. Its operation depends upon the fact that a change in current demand by the load (oscillator) will change the bias on the regulator tube, thus passing either more or less current, thereby maintaining a steady voltage to the load.

Unregulated voltage from a 6X4 rectifier is supplied to a voltage divider consisting of a 50,000-ohm resistor in series with a 50,000-ohm potentiometer connected between the plates of a 12AU7 (regulator) and ground. The grids are connected through a 10,000-ohm resistor to the arm of the potentiometer, which serves as the *uhf* output control. The setting of the potentiometer determines the operating point of the tube. As the output voltage decreases (due to increased oscillator current) the voltage across the divider decreases, and the grid becomes less positive causing the plate current to decrease. The decrease in plate current causes an increase in plate voltage, which is also applied across the divider. The grid goes in a positive direction, thus restoring the regulator tube to its normal operating point. The regulated voltage is obtained from the cathodes of the 12AU7 and its magnitude is controlled by the *uhf* output control.

The operation of the cavity can be visualized by considering the case as an inductance consisting of many single-turn coils connected in parallel. The capacitor is of the split-stator type utilizing a precision ground glass cylinder, which has two metal collars affixed to its outer surface. A silvered glass plunger traveling inside the cylinder is the *rotor* of the capacitor. Since there is no physical contact between the rotor and the stators, noise-free operation is secured. The tube socket as well as the other circuit components are enclosed within the cavity. Rigid mechanical construction has been adhered to, to void any tendency toward microphonism or frequency modulation. The output of the cavity terminates in a 50-ohm *BNC* connector. The connecting cable is supplied with a pad terminated in 300 ohms. When the meter switch is in the *uhf* position, the meter indicates the relative amplitude of the *uhf* signal.

The crystal rectifier is essentially a square-law device, particularly at low voltage and, therefore, calibration is not linear.

Applications

Gain measurements on a converter may be made by connecting the *uhf*

(*Continued on page* 69)

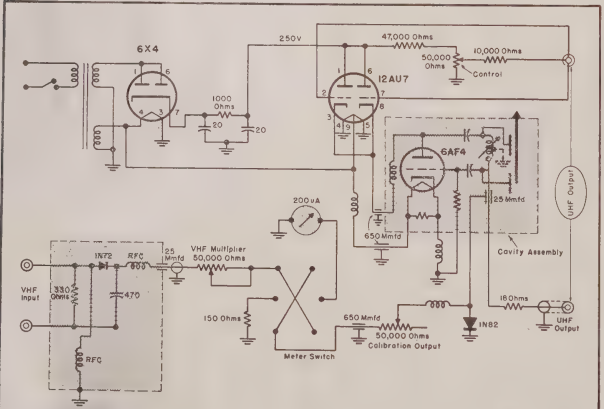


Fig. 1. Circuit of the Granco signal-gain generator.

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*From exclusive report prepared for SERVICE by **Harry Kahn,** Field Engineer, Granco Products, Inc.

[1] Granco Model SU-200; range 440 to 910 mc. Has output meter for frequencies up to 300 mc.

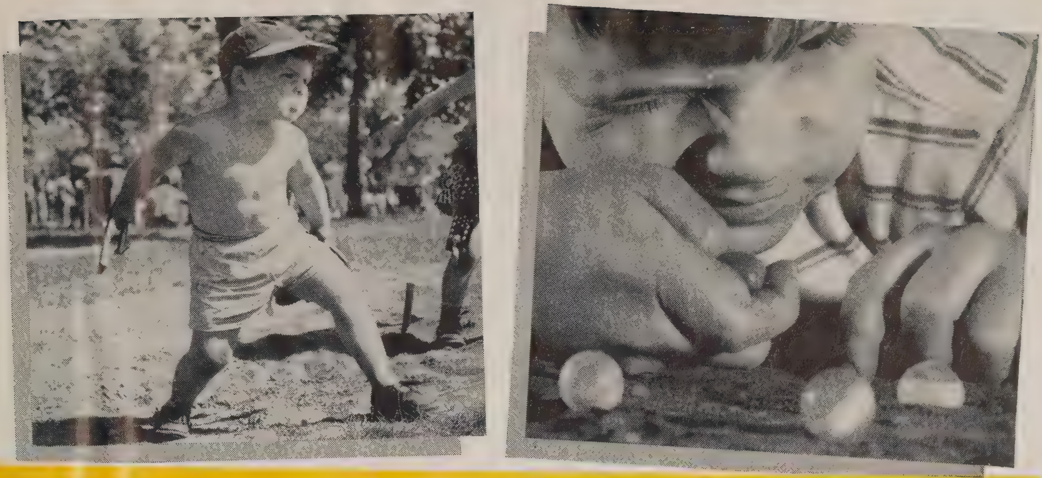

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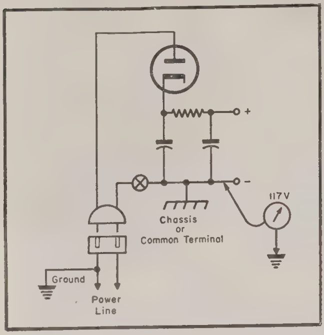
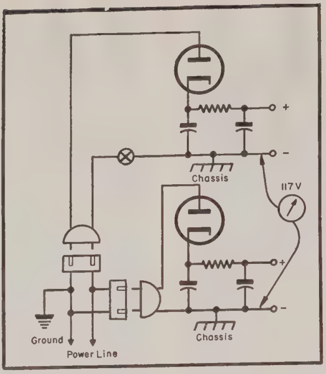
Fig. 1. Basic circuit of an ac/dc supply, illustrating ground danger points.



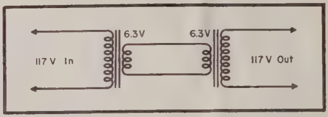


(Left)

Fig. 2. Another possible source of danger; two receivers operated at the same time with both legs of the power line exposed.

(Below)

Fig. 3. Isolation transformer hooked up to provide separate ac receptacle for use on ac/dc chassis servicing.



SAFETY In SERVICING

by SIDNEY ROTHMAN

Precautions That Every Service Man Should Take in Installing and Repairing AC/DC Receivers and TV Chassis, Too

MANY perform their daily assignments safely the way little boys eat spinach; they do it, but don't like it.

It's hard to understand why so many grownups apparently have such a disregard for safety. They know it's good for them, and shouldn't have to have it fed to them on a spoon.

Every Service Man is certainly aware of the potential danger of electrical circuits, and the safety precautions that must be exercised. They know that electricity can kill by burning, suffocation, or by violent interruption of the natural rhythm of the heart. And yet many simply dismiss the hazard that does exist. Strangely enough, the peril is as great or greater to the experienced man, who has often grown falsely secure, as it is to the beginner, who is ignorant of the sources of the danger.

A majority of the radios reaching the service bench are the common *ac/dc* variety. The Underwriters' Laboratories have set down regulations governing the manner in which these sets may be constructed so that they present a minimum shock hazard to the listener. The Service Man is expected to be able to look out for himself. Then too, the *UL* regulations are obligatory only on manufacturers in States which have made them law.

The basic power supply diagram of an *ac/dc* chassis shows its inherent danger. This rests in the fact that one side of the incoming *ac* power line is also the common negative return for the *B* supply, the positive terminal of *avc* and bias voltages and the usual tie-in point for filter and bypass circuits. In addition many manufacturers connect the chassis as well to this line.

It is necessary for the Service Man to make connections to the negative return in the process of servicing. When he connects a signal generator, a 'scope or similar instrument, the metal case of the equipment actually becomes an extension of the *ac* power wiring. When the plug *happens* to be in the *ac* receptacle as shown in Fig. 1, a 50-50 possibility, the full voltage of the power line exists between the case and all actual grounds. The nearest such ground point is the metal receptacle box and the conduit associated with it.

A handy way to avoid creating such a potential death trap is to install a 117 *v* bulb on the bench with one terminal permanently connected to an *ac* ground and the other terminal to a short test lead. It is then only a minutes work to check the receiver plug for a dangerous connection. One should acquire the habit of touching the test lead to the common return in the set. If the lamp lights, the plug should be reversed.

Some Service Men customarily insert an isolating capicitor in the return lead to the instrument. This may be about .05 mfd, 600 *v* rating and should be located in the lead as close to the receiver as possible. Naturally it cannot be used when measurements of *dc* are involved, and in some circumstances there will be hum developed across this additional series impedance. It should be used where practicable, but in every instance, one should be sure by checking with the light.

There is another less obvious source of great danger; when two sets are being operated on the bench at the same time. This problem is illustrated in Fig. 2; in this instance both legs of the power line are exposed in a setup which means serious trouble. Once again the check light can be used to insure all units being at ground potential.

A service bench can be made safer under all conditions by installing a separate *ac* receptacle for *ac/dc* sets only. This should be fed from an isolation transformer. Transformers for use on 117 *v*, with a turns ratio of 1:1 and a power capability of about 50 watts are available, or one can be constructed by connecting two filament transformers *back-to-back*. Transformers of the 6.3 *v* type, rated at 5 or 6 amps, will handle one *ac/dc* receiver. Of course only one receiver should be plugged in at a time or the purpose is defeated.

The hazards in TV servicing lie not so much in the very-high voltages used to operate the picture tube, but in the tube itself. The voltages are high only when microamperes are being drawn and fall quickly before

(*Continued on page* 86)

HI-FI Symptom/Trouble-Source Table

Troubleshooting Motorboating, Hum, Lack of Bass or Treble, Tone Controls and Noise

by MARK VINO

Symptom	Possible Sources of Trouble
Motorboating.	Open filter capacitors.
	Loss of capacitance in coupling capacitors within feedback loop, introducing low frequency phase-shift.
	Replacement of high-quality output transformer within feedback loop by low quality unit. Phase shift.
Hum, phono only.	Circuit defects in preamp stage.
	Proximity of magnetic cartridge or separate preamp to power transformer or choke.
	Broken ground connection to metal tone arm or record player frame.
Hum, receiver only, accompanying *rf* carrier.	Heater-cathode leakage in mixer or detector tubes.
	Lack of earth ground; for *ac* type receivers only.
	Open line bypass capacitor.
Lack of bass; all signal sources.	Improper speaker enclosure.[1]
	Loss of capacitance of coupling capacitors.
	Loss of capacitance of cathode bypass capacitor.
	Improper matching of high-impedance output to low-impedance input circuit.
Lack of bass; phono only.	Circuit defects in preamp circuit.
	Defective cartridge.
	Defective bass-boost equalizer circuit in preamp for magnetic pickup; open capacitor, etc. (See Fig. 1.)
	Too low a shunt resistance across crystal or ceramic cartridge.
	Incorrect equalization for a particular record with high *turnover* frequency.
Lack of treble.	Long, high-capacitance cable used in high impedance circuit.
	Shunt capacitance thrown across signal circuit by defective component.
	Too low a shunt resistance across magnetic pickup. Manufacturer's recommendations for pickup load resistance should be followed.
Tone control inoperative.	Open or shorted capacitors in frequency discriminating circuits. (See Fig. 2.)
Noise.	Defective tubes, capacitors, resistors, especially in low level circuits.
	Frayed cable shields.
	Intermittent contact between cable shields and components or chassis'.
	Loose circuit connections, or loose fit between tube pins and socket.

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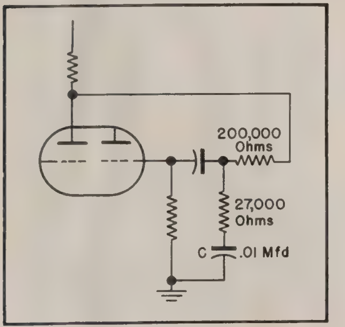
[1] *Audio Conversions for Hi-Fi Results*, SERVICE; August, 1953. *Testing and Measuring Audio Equipment*, SERVICE; June, 1953.

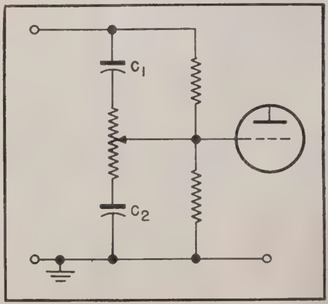


(Left)

Fig. 1. Bass-equalizing circuit of G.E. type preamp. If C were shorted out, operation would be normal except that there would be no bass boost. With C open the lack of bass boost would be accompanied by increased gain. In either case record reproduction with a magnetic pickup would suffer severe bass attenuation.

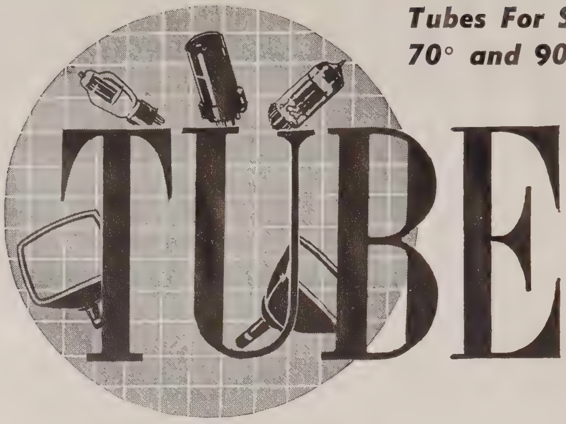
(Right)

Fig. 2. Treble-boost circuit. If C_1 were open there would be no treble boost, and if C_2 were open there would be no treble cut. In both cases operation would be otherwise normal. With C_1 or C_2 shorted, on the other hand, the tone control would affect overall volume.



Tubes For Series String TV Chassis . . . 70° and 90° 17", 21" and 27" Picture Tubes

by E. A. TEVERSON



TUBE *News*

THE RECENT trend toward simplified TV receivers has introduced many new chassis requirements, such as series strings for tube heaters, with operation directly across the power line without a heater transformer.

For this purpose tubes with 600-milliampere heaters, have been developed.[1, 2] According to one of the series-tube makers,[1] thermal characteristics of all of the heaters are controlled so that the heater voltage surges during the warmup cycle are minimized; the tubes must be used with other types similarly controlled.

In one line[1] of heater tubes, types have been designed for 2.35, 3.15, 4.2, 4.7, 6.3, 12.6, 18.9 and 25 heater volts, all with a heater current of .6 ampere. Some of the types in the assortment include *2AF4* (prototype 6AF4), *3AL5* (prototype 6AL5), *3AU6* (prototype 6AU6), *4BQ7A* (prototype 6BQ7A), *6SN7GTB* (prototype 6SN7GTA), *12L6GT* (prototype 25L6GT), *19AU4* (prototype 6AU4GT) and *25CD6GA* (prototype 25CD6G).

Another lineup[2] includes 3BC5, 3CB6, 5AN8, 5AT8, 5J6, 5U8, and 12L6GT. Except for items involved in the changes of heater design, these types correspond electrically and mechanically to the 6BC5, 6CB6, 6AN8, 6AT8, 6J6, 6U8, and 25L6GT, respectively.

To minimize voltage unbalance across any individual tube during starting, high-wattage resistors, preferably with positive temperature characteristics, are being wired in, in series with the string. The heaters of the 3CB6, 5AT8, 5J6, and 5U8 types, which are intended for use in the tuners of TV receivers, will be found connected close to the ground end of the *ac*-heater line to keep the heater-cathode voltage within the tube rating.

The 3BC5 is a sharp-cutoff pentode of the 7-pin miniature type having a 3.15-volt/.6-ampere heater. It is intended for use as an *rf* or *if* amplifier.

The 3BC6 is also a sharp-cutoff pentode of the 7-pin miniature type having a 3.15-volt/.6-ampere heater, but intended for use as an *if* amplifier up to about 45 mc. It is also suited for use as an *rf* amplifier in *vhf* tuners.

The 5AN8, a general-purpose, multi-unit tube of the 9-pin miniature type having a 4.7-volt/.6-ampere heater, is intended for a variety of applications. The pentode unit may be used as a

(*Continued on page 73*)

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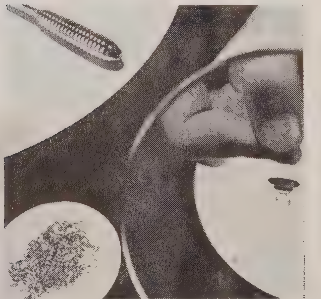
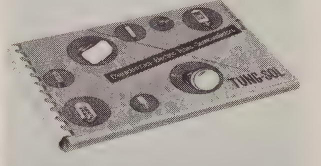
[1] Tung-Sol. [2] **RCA.**

Three steps in new method of transistor production. The ingot in the upper left corner was produced in two hours by rate-grown method, then sliced into thousands of tiny bars, shown in lower left; and bar with leads attached becomes a transistor. Simplicity of transistor construction is shown in magnified view on the right. A cap is added and the unit hermetically sealed in final product. (Each transistor bar measures 20-thousands of an inch square by a tenth of an inch long.) A quarter of a pound ingot contains enough germanium to produce some 2,000 transistors; enough transistors to implement about 300 table model radios. In triode configuration, usable gain of up to 15 mc, it is said will result; tetrodes made from the transistor bars will provide usable gain up to 150 mc. Oscillation from the transistor triodes may be obtained up to 35 mc, while from tetrode transistors, oscillating frequencies up to 300 mc are claimed to be obtainable. (General Electric.)



Tube characteristics manual containing 200 pages of data on 600 receiving tubes, 110 premium types, 170 picture tubes, 85 diodes, plus tube base diagrams, color codes, dial lamps and numbering codes. (Tung-Sol Electric Inc., Newark 4, N. J.)



Charles F. Adams, Jr., at left, president of Raytheon, presenting to Massachusetts Governor Christian A. Herter the millionth transistor to be produced by the company. Although the hearing-aid industry continues to use the majority of Raytheon transistors, their germanium junction transistors are also being used in a low noise, high intelligibility microphones, to replace carbon microphones in aircraft, mobile inter-communication equipment, and radio systems; portable audio frequency oscillators; small oscillators, crystal controlled, for use as secondary frequency standards; hospital and factory paging systems; flashlight battery-powerd, high-voltage supplies for operating portable radio-activity measuring instruments; preamp and magnetic amplifier in combination for controlling motors; sound pickup heads for amplifiers of film projectors; and telephone amplifiers for railroad dispatcher use.

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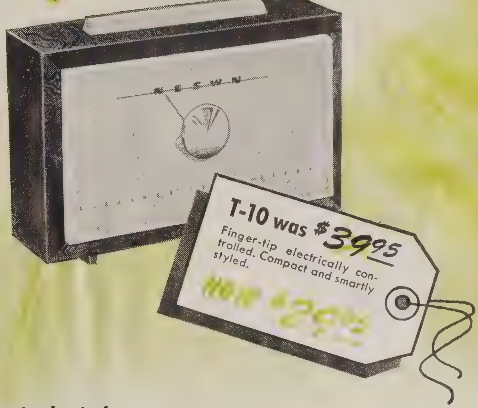

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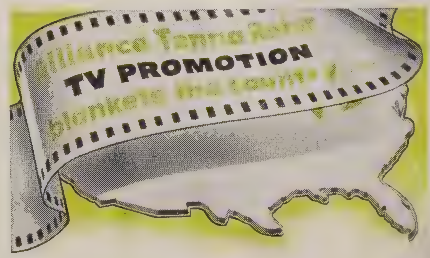

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Broad-Band Helix Antennas‡. . . New Product-Technique Review: Tuners,

UHF-VHF
TV
ANTENNA DIGEST
DESIGN • APPLICATION
INSTALLATION • SERVICE

by RALPH G. PETERS

On channels *7* to *13*, receivers normally have less sensitivity than on channels *2* to *6*, and transmission line losses are much higher. Thus antennas offering increased gain on the upper channels have always been found to be particularly popular.

In building high-gain features into the *7* to *13* models, assorted designs have obtained. Recently it was found that the helix approach[1] could be introduced into an all-band model, by inserting it at the high band front end.

Helix antennas have been primarily designed for microwave use, where extremely high gain and sharp directivity are necessary. The normal configuration of such antennas has been in the form of a large coil mounted horizontally with a screen reflector. If one viewed the coil from the side, it would be found that each turn had a definite spacing and a slant or forward pitch in relation to the horizontal axis. This angle and tilt determine the gain of the antenna, and the range of frequencies over which it will operate. If an antenna were scaled to the *vhf* channels, the physical size would be very large and impractical, to say nothing of the mechanical support problems. It was felt that the electrical principle of the helix, utilizing different spacings between antenna sections and simulating the effect of the slant of the coil turns could be adapted for TV frequencies in a flat plane form. The helix portion was developed independently, and the response curve was found to be quite flat across the high channel spectrum. The individual sections of the helix alone are not symmetrical, nor do they have a linear taper from the back to front. Each section was constructed separately for high gain at a particular frequency, and then combined to form the full helix. In the assembled position, each center point of the helix is attached to the crossarm by means of a snap fastener. The center of the helix is pivoted on a permanent rivet, and the back, or the point where the harness is taken off, locked by wing nuts.

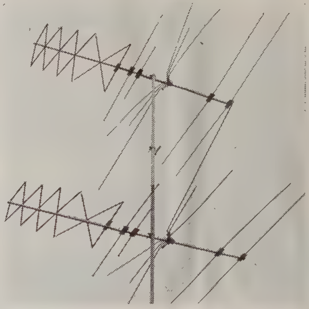


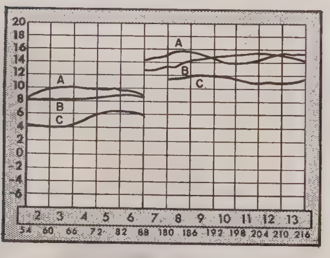
Fig. 2. Half-wave stacked helix model. (Courtesy JFD)

Electrically, the TV antenna helix is a center-grounded antenna, unlike earlier types that may have a somewhat similar appearance.

The helix is connected to a conical through an insulator-supported wire form harness. The harness is transposed and permanently connected to the insulator supporting the back of the helix. One insulator is located adjacent to the mast position to eliminate possibility of the harness shorting at this point.

The curve chart (Fig. 1) indicates performance properties of three different versions of the helix. Low channel gain of one model[2] has been improved through the stub action of the combination of harness length and the first section of the helix. This section is, of course, in parallel with the flat plane conical, and designed to present a minimum loading effect on channels *2* to *6*.

Fig. 1. Chart submitted by JFD illustrating gain characteristics of three antennas using helix design at high end; A = half-wave stacked, B = stacked, and C = single-bay models.



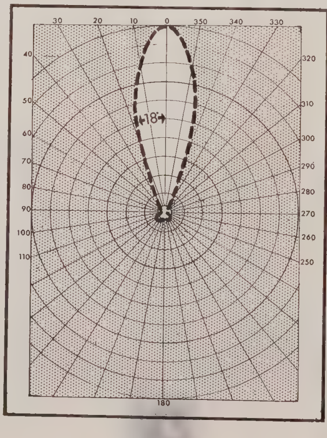


Fig. 3. Composite polar pattern for helix antennas. (Courtesy JFD)

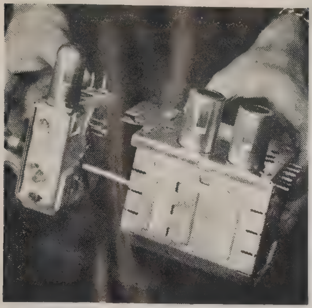
Douglas H. Carpenter addressing group from greater Huntington area, West Virginia, on problems of multi-channel and fringe reception involving pickup of channels 3 and 8 using broad-band antennas.

---

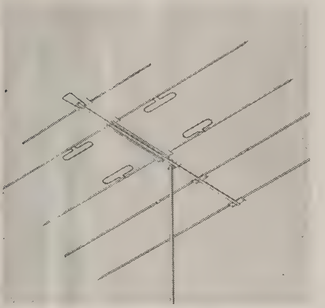
‡*From notes prepared by* **Douglas H. Carpenter,** *Chief Antenna Engineer, JFD.*

[1] *JFD Jet-Helix.* [2] *JFD Super-Jet.*

Coax Connectors, Towers, UHF-VHF Antennas, and Instrumentation

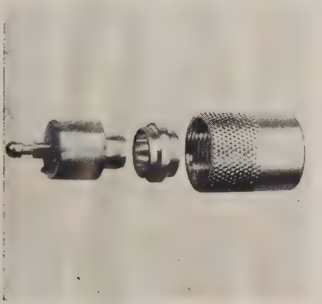


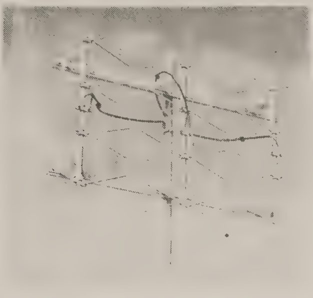
Separate tuners designed for uhf **and** vhf **coverage, that are mounted coaxially and plugged together to make a single unit. Complete device consists of a cascode** vhf **tuner, and a capacitance tuned, resonant coaxial cavity,** uhf **tuner. The** vhf **(channel-switching)** cascode **tuners employ a 6BZ7** rf **amp and 6U8 oscillator-mixer. Designed to operate** into a standard **41 mc** if tube **such as a 6CB6, and is link coupled to output. UHF tuner, of the continuous type, uses a very high** Q **double-tuned coax line. A 6AF4 oscillator is tuned with a similar coax line. Mixing is accomplished by use of a crystal diode. The** uhf **unit is designed to slip coaxially over the shaft of the vhf tuner and plug into the front of it.** (Model UV-13; Sarkes Tarzian, Inc., Tuner Division, Bloomington, Ind.)



Inline-type antenna featuring gold-klad **wave traps. Claimed to provide yagi performance and directivity.** (Hunter model; Clear Beam Antenna Corp., 100 Prospect Avenue, Burbank, Calif.)

Solderless coax cable connector. Has a radial grounding contact. For community TV, instrument and communications circuits using RG 11/U or equivalent cable. (Entron, Inc., 4902 Lawrence St., Bladensburg, Md.)

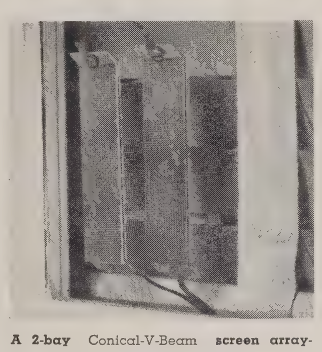




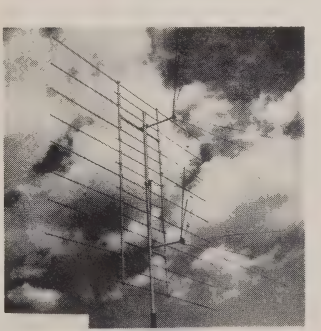
UHF antenna with twelve open bowtie driven elements plus a screen reflector. Driven elements are connected in parallel to a common terminal panel, while individual 4-bay arrays are driven in series parallel. Reflector screen is made in one piece folded at center for packing. (Super 12; Technical Appliance Corp., Sherburne, N. Y.)

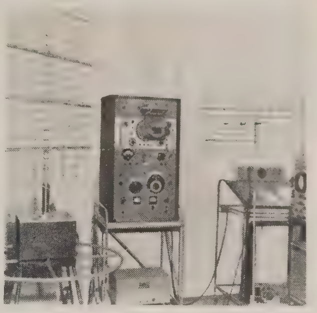
(Below)

Phantom feed-thru designed to bring TV signal through the glass of a window. Item is attached to the glass with a waterproof adhesive. Plate is four square inches in area. (Industrial Television, Inc., 359 Lexington Ave., Clifton, N. J.)

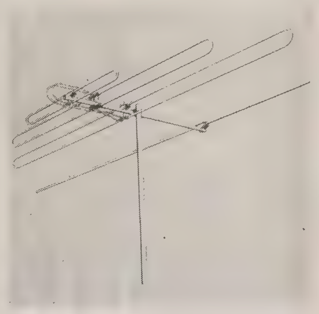


A 2-bay Conical-V-Beam **screen array. The V beam action against the non-frequency sensitive screen reflector is said to provide an in-line single-lobed directional pattern in both horizontal and vertical planes on all frequencies.** (King Pin Model 202; Telrex, Inc., Asbury Park, N. J.)



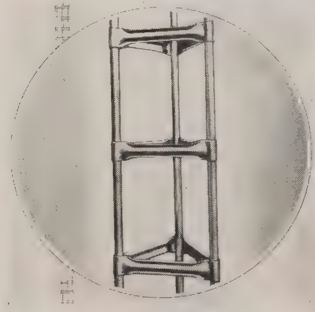


The antenna-scope **(center) which is said to display on the screen of a polar 'scope the true voltage field pattern of any antenna being tested. The speed of this pattern is claimed to be limited only by the rapidity at which the antenna may be rotated. Antenna rotational speeds of 30 to 60** rpm **are used and a complete field pattern can be plotted in 1 to 2 seconds. At left, antenna (model 400-SA) with the** fro-bac **dimensional screen, undergoing** antenna-scope **evaluation test. Antenna-scope is equipped with 2 oscillators for full coverage in the 50-1000 mc range. Various probes may be attached to the antennas to simulate either balanced or unbalanced loads of the desired impedance. The unit is said to be the only one of its kind.** (The Finney Company, 4612 St., Clair, Cleveland 3, O.)



VHF antenna with a phasing system claimed to isolate interaction and loading of phased elements, and allow low band dipole to function with effective gain and pattern response in high band. (Sabre model 100; Welco Manufacturing Co., 225 S. Third St., Burlington, Ia.)

Tower said to be self-supporting to 50' heights or guyed to 150'; features a 12½" triangular design with corrugated cross bracing. (No. 6 Tower; Rohn Manufacturing Co., 116 Limestone, Bellevue, Peoria, Ill.)



TV Master-Antenna System CHAIN AMPLIFIERS*

by LESTER C. SMITH, *Chief Engineer, Spencer-Kennedy Laboratories, Inc.*

Characteristics of Distributed Amplifiers . . . Application Considerations

IF ONE examines the values of the circuit elements in a chain amplifier,[1] one will find that the grid and plate lines have quite low characteristic impedance, with the result that the amplifier is not at all critical to the precise values of the tube stray parameters. As a consequence, the shape of the response curve of an amplifier is only changed very slightly when tubes are changed. Once properly adjusted at the time of manufacture, it will be found that this chain amplifier does not need readjustment unless its components are physically distorted.

Linearity of Phase Curve

It can be shown, both theoretically and experimentally, that an amplifier of any type which has flat gain over a very wide band has a phase curve which is more flat in any small region within this band, than an amplifier which is designed to amplify only this small region. Since, in the case of a wide-band chain amplifier for TV, each channel occupies only a small portion of the total pass band, the phase curve is very flat and straight over any channel. This flatness of phase curve, when coupled with the excellent flatness of the gain curve, has been found to provide distortion-free amplification of complex TV signals, without smear, overshoot, or ringing. This characteristic will be at least as important in color TV as in black and white.

Impedance Matching

For satisfactory performance, the input delay and output delay lines of a chain amplifier must be properly terminated in resistive loads. This turns out to be a major advantage in practical applications, since with suitable skill this matching can result in an input impedance to the amplifier and an output impedance from the amplifier which are each very good impedance matches to the transmission line. This effective impedance match means that there are negligible interaction effects when these amplifiers are connected to other pieces of equipment; and it also means that the amplifiers do not set up reflections on the incoming line; happily, they absorb any reflections traveling toward them along the output line.

Because the amplifiers can be made to have quite flat response curves and because amplifiers of this type have been found to be stable with time, temperature, and humidity, one amplifier can be removed from service at a certain position and another installed at this position without appreciably changing the overall frequency response of the system.

One pleasant consequence of adding the plate current of several tubes is the improvement in noise figure which results. Since the noise in the various tubes is random and uncorrelated, these noise currents add as the square root of the sum of the squares, whereas the signal currents add directly. As a first approximation then, the more tubes one uses in a chain, the better the noise figure becomes.

The fidelity and power-handling capabilities of an amplifier of this type is much the same as in conventional amplifiers. The performance may be excellent if the equipment is properly designed and intelligently utilized.

Ability to Handle Adjacent Channels

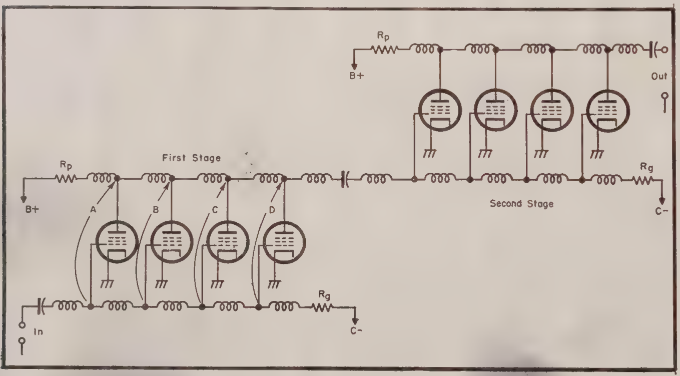
Since the amplifier will handle any type of complex signal which lies within its pass band, it operates as well on adjacent channels as on channels separated by many megacycles. In fact, it has been found that this amplifier could easily handle several thousand separate telephone messages if they were modulated on suitable carriers separated by 5 to 10 kc.†

Practical Considerations

An amplifier of the chain design type does not cease operation if one of the tubes has an open electrode. As

(*Continued on page* 85)

Two stage distributed or chain amplifier.



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[1] SKL.

From a report presented at the third annual National Community Television Association convention in New York City.

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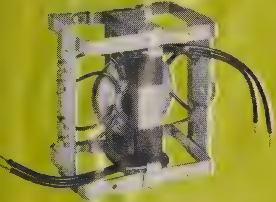
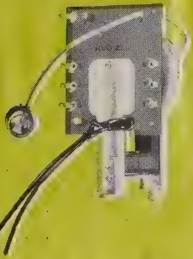
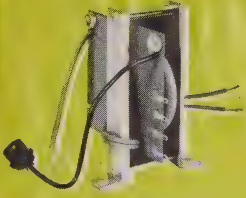


HVO-21
PHILCO



HVO-24
ADMIRAL



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g up-to-date replacement components for all models and chassis of TV receivers.

Service Engineering — field and shop notes

by THOMAS K. BEAMER

Dial Drives and Cable Systems in Communication Receivers . . . General Repair Hints

One feature found in communication chassis that is different are the dial-drives. They range from planetary gear systems using belts down to ordinary dial cables; and even the dial cables are far from ordinary. Due to the presence of two tuning dials, the main tuner and the bandspread, the cable systems are rather complicated. Many sets incorporate small indicators for various controls, such as volume, tone, band-indicators, etc., driven by cables, which appear through small windows in the panel. Unfortunately, access to the dial drive drum and cables is unnecessarily complicated in most models, requiring the almost complete disassembly of the front panel, removal of all knobs, dial-pointers, and several controls. The correct setting of dial pointers is a very difficult job; the scales must be removed with the panel.

Some sets use gear drives, with bandspread accomplished by vernier drives, actuated by pinion gears on the main drive. This method is used in Hammarund's Super-Pro series. Hallicrafters use cable drive for many of their popular models. This is a dual-drive system, in which the pointer or indicator is fastened at both top and bottom, and the cables travel in the same direction. The actual restringing of the cables is simple enough, being very similar to the dual-drive system used on Stromberg-Carlson 1200 and 1110 series home receivers. The Hallicrafters sets use a flywheel on the drive to speed tuning from one end to the other.

Replacement of cables follows standard *home-set* procedure. One must be sure to use only the very best grade of dial cable available, fasten all knots securely, using a dab of nail-polish or cement on each knot, and wash all grease and oil off the cable with carbon-tet before reassembling. One should lubricate only where absolutely necessary, and then only a very thin film of some good *cream* type lubricant should be used. Light oil should never be used anywhere in these systems, as it may creep out on the shaft and onto the cable, causing slippage. At times it may help to give the cable a very light dressing with beeswax sticks used for non-skid material; do not apply this too heavily. One should also check the tension on all cables carefully, and run them through a full cycle, both ways, several times, to see that there is no tendency for the cables to *half-hitch* on the drive drums or shafts.

When replacing front panels and dial scales, all parts should be checked carefully as replaced, to be sure that they do not introduce any binding.

Power Supplies in Comm Receivers

Power supplies in most of *comm* sets are more or less conventional *straight-ac* types, using power transformers, with plate voltages running from 300 down to 200. Some makers use the *ac/dc* circuit in their smaller models. Inasmuch as the chassis are usually contained in metal cabinets, this makes necessary the insulation of the chassis from the outside of the cabinet, and the isolation of the antenna coil. One must be sure that this insulation is in place, and not damaged or shorted in any way, to avoid the possibility of severe shock to operator. The isolation of the antenna coil primary winding should be checked, as a ground here could cause burnout of the coil when the external ground is applied.

The Super-Pro sets use a separate power supply connected by a multiconductor cable. This is terminated in a *lashed* set of terminal lugs, mounted on a board, which is connected to a corresponding set of terminals on the rear apron of the chassis. Although this is polarized, so as to make accidental misconnection almost impossible, if one of these sets comes in with all the tubes blown out, look for signs of an inversion of this strip. Although, as noted, it is almost impossible for this to happen, it has happened.

General Hints and Kinks on Maintenance

A quick condition check can be made on a *comm* receiver by connecting it to an antenna and running over each band, noting performance, sensitivity and calibration; also checking for signs of home alignment. One should also check for action of the *avc* circuit, and then check all gain controls for quietness and calibration by tuning in *WWV* at each frequency available. In general, it is wise to look the sets over carefully for signs of faulty service work, such as bad solder joints, etc.

The average signal generator is not quite capable of providing the extremely accurate signal source required in *comm* set alignment. However, as indicated, there is an excellent method of insuring absolute accuracy for practically any frequency setting by tuning in the government's standard station *WWV*, which is on the air 24 hours a day, on 2.5, 5, 10, 15, 20, and 25 mc, and can be heard practically over the entire country on at least two or three frequencies. The lower frequencies, 2.5 and 5 mc, sometimes are not too strong in the midwest, but the 10 and 15 mc signals have been reported as audible practically everywhere. In addition, *WWV* modulates their carrier with a standard audio tone of 440 cps (standard pitch *A*), and a time-tick once per second. There's also an interruption of this *tick* at the end of each minute and five minutes, and a time announcement every fifteen minutes.

To make use of this indispensable medium, the receiver should be set up and the calibrating adjustments made using the shop signal generator. Next, a good outside antenna should be connected to the set and the reception of *WWV* checked at all audible points. Any corrections necessary may be easily made. Of course, the shop generator can be checked against the standard frequency, and any needed

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*Based on report prepared for SERVICE by **Jack Darr.**

correction made when making the initial calibration.

It may be necessary to *rough-in* the antenna and *rf* adjustments while the calibration is being checked, as the selectivity of the front end may be such as to prevent any signal getting through, if badly misaligned. Once the calibrating adjustments have been completed, the *rf* and antenna trimmers should be checked for proper adjustment at the high end of each band, and the padding adjustments at the lower ends. The dual adjustments will be found on practically all bands, with the exception of the very highest frequency band. It seems to be a common design practice to provide only trimmers for these, allowing the capacity of the coils to take care of the lower end.

Tracking sometimes presents a problem. This is ordinarily a design condition. One common cause of mistracking is improper alignment of the oscillator, setting it on the image frequency instead of the fundamental. This should be checked as outlined, if any sign of mistracking is noted; practically all of the better receivers will track to within .05% over the entire band on any range. If a 1,000-kc crystal is on hand, it may be used for a quick check of tracking and calibration over each band. Accuracy of the crystal can be quickly checked against *WWV* by beating the crystal output against the standard, on any harmonic. Many of these small crystals are remarkably accurate; one was found which zero-beat with *WWV* on its tenth harmonic. These are ordinarily used in the signal generator having provisions for crystal-controlled output. However, a Pierce oscillator circuit can be set up, using practically any kind of tube and power supply to supply numerous usable harmonics for testing.

•

TV ALIGNMENT TOOLS

S. B. Valiulis, prexy of General Cement Manufacturing Co., examining series of special-purpose alignment tools designed for TV sets. Five basic types of alignment tools are included in line: Slug tuners; unbreakable plastic screwdrivers of various lengths; K-tran tools; plastic hex wrenches; and stud adjusting tools.

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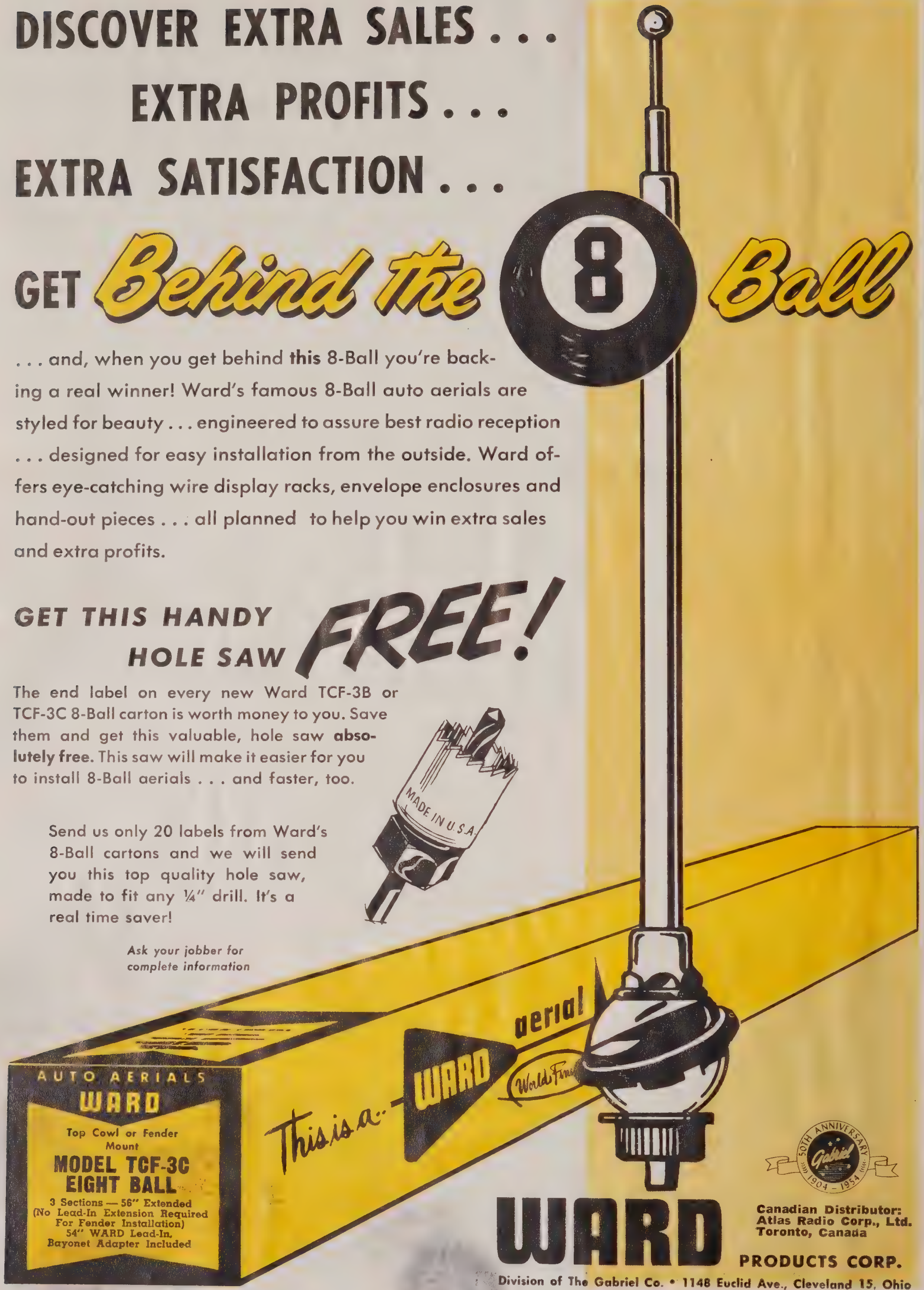
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SERVICE...The National Scene

UHF/VHF SATELLITES PROPOSED TO SOLVE SPOTTY COVERAGE--Complementing the recent FCC ruling which would allow the installation of slave ultrahigh transmitters, fed by vhf or uhf signals, and operated either as auxiliary or new stations, RETMA's committee on satellite and special service TV broadcast stations issued a report stating that satellites (formerly called boosters) represented an answer to drooping and wavering transmission and reception. Such stations, it was noted, would be unattended and operate on the same channel as the mother or controlling station upon which it depends for all of its program and identification material, and could be tailored to a specific location, where it is not economically or technically feasible to provide TV service directly from the primary station. . . . Tests in the South and East have demonstrated the practicability of these field systems, committee members reported. In the Vicksburg area, where a 10-watt unit was used, it was said that the key station obtained an effective power increase of 200 in shadowed areas and a 23-db improvement in field intensity in at least half of the total receiving area. . . . A typical satellite was described as one employing a 16-element stacked colinear array with a minimum gain of 22 for pickup, a corner reflector with a nominal gain of 11 db for retransmission, and 10-watt power output amplifying system using 2C39A lighthouse tubes.

NEW CHAIN STATIONS, operating on specially-assigned uhf channels, originally called satellites, and now tagged special service outlets by RETMA, would, it was said, perform similarly to any TV broadcast station, except that they would not originate any local programs.

THE COMMISSION's notice and industry's report, it is generally felt, should serve to spur uhf TV and help develop a diversified nationwide TV service.

HEAVY NEW ENGLAND HURRICANE DAMAGE BOOMS ANTENNA INSTALLATIONS--Service Men in Boston, Bridgeport and scores of other New England cities found themselves swamped with rush calls for new antennas and general repairs, when the 100-mile blasts of the recent hurricane subsided. . . . In some cities, shops were obliged to gear up for two-shift operation, working up until midnight using portable floodlights. . . . In one metropolitan area nearly 1,000 antennas were ripped up. . . . Elsewhere Service Men reported that antenna calls were coming in at a 30-per-day rate, with complete replacements required on most calls. . . . One distributor declared that he had sold over 700 antennas within forty-eight hours, and the orders were still pouring in. . . . Even in New York, particularly on Long Island, the roaring winds left a wild pattern of destruction, resulting in urgent demands for new antennas. . . . In hundreds of communities, calls were delayed by fallen light and phone poles, disrupting communications. . . . Here and in other gale-hit towns, where rooftops were also severely damaged by flying debris and toppled trees, repair has just begun. And many weeks and perhaps months will pass before it will be possible to complete all the calls and install antennas, leads and accessories that were smashed or swept away during the storm.

74° PICTURE TUBE INTEREST GROWING--The recent development of 21-inch picture tubes using a 74° deflection angle instead of 90°, allowing the use of 70°-drive components to provide a sweep that is said to be nearly as effective as that available in the wider-angle tubes, has generated substantial interest among set and tube makers. . . . The new approach, evolved as a compromise measure, to expedite the manufacture of moderately-priced lightweight chassis, has resulted in a tube that is the same length as the 70° 21-inch type, although the faceplate is larger. . . . A number of tube makers have announced production plans for the tube; one has designated it as the 21AWP4. . . . Several set makers have said that a general changeover to the new tube will occur during January '55.

SERVICE... The National Scene

TRANSISTORS NOW AVAILABLE FOR ULTRAHIGH OPERATION--A new family of junction transistors, operating on an intrinsic-barrier principle, capable of operating on frequencies up to 400 mc, has been developed. . . . Labelled a germanium-club sandwich, an intrinsically pure layer has been added to the basic positive-negative-positive water; this region in the midst of the transistor is said to permit the faster movement of positive charges, isolate the input and output areas and reduce the stored energy to make functioning at higher frequencies possible. The increased separation of the input and output areas were also described as permitting operation at voltages higher than possible in earlier models. . . . Tiny dots of indium, a low-resistance metallic element found as an impurity in zinc blends, are connected to the opposite faces of the intrinsic wafer (n-type) to provide input and output electrodes. . . . When electrical current is applied to this new type transistor, holes introduced at the positive section at low voltage spread across the negative region at increased speed. The holes then drift at maximum high velocities through the neutral region to the output section of the crystal. There, at greatly increased voltage, they are collected to provide useful power output and gain. . . . The new device, like other junction transistors, can operate at extremely low power, but unlike earlier models, it can also operate at relatively high power, perhaps up to a half-watt.

PRODUCTION-LINE NINE-TRANSISTOR PORTABLE DISPLAYED--A completely-tubeless portable using nine transistors that it is expected will be available as a consumer item this fall, was exhibited recently during a meeting in the south. Model demonstrated operated on four flashlight batteries. . . .Commenting on cost, a company spokesman said that initial models will probably be substantially higher priced than tube-type portables, but the number of transistors will be eventually reduced, perhaps to seven, and costs reduced accordingly.

TV TUNEUP CAMPAIGN SET FOR FALL--A consumer-aimed promotion program designed to help TV Service Men alert set owners to the benefits of periodic tuneups has been initiated by a leading tube and set maker. . . . The plan, spotlighting a Fall TV Tuneup Special, will revolve about seven check points which can be made in the home without the removal of a chassis: Adjustment of focus, agc, frequency and horizontal and vertical-linearity controls; inspection and adjustment of tuner oscillators; and a performance check of the low-voltage rectifier and power-output tubes.

LIEBOWITZ NOW NETSDA PREXY--At a meeting of the National Electronic Technicians and Service Dealers Associations in New York, Max Liebowitz was elected president, to serve until the first of the year. Others named were Dave Van Nest, vice prexy; John Wheaton, secretary; T. L. Clarkson, treasurer; and Bert Bregenzer, chairman of the program and steering committee. . . . License bills, pending in New York City and Pennsylvania, will be reviewed at the next meeting in November.

EIGHT SEMINARS SCHEDULED FOR NATESA CONVENTION--The fifth annual national convention of the National Alliance of TV and Electronics Service Associations, which will be held at the Morrison Hotel from September 24 to 26, will feature demonstration-talks on color, printed circuitry, antenna installation, tape recorders and business methods. About six hours will be devoted to a series of lectures on color receivers and test equipment.

FM LISTENING SOARS IN PHILA. . . . SERVICE CALLS JUMP--The FM set, once discarded and discounted, has become a very popular item because of its noise-free and fidelity features. In many cities, Service Men have reported that FM service calls are increasing constantly. In Philadelphia, where the FM audience is considerable because of the large number of stations in operation, shop owners described FM as a blessing, for FM calls kept them extremely busy and out of the red during the usually-dull summer months. FM, they say, is no longer a forgotten medium, but rather a very active one, truly a favorite master now.--L. W.

LEADING TV SET MAKERS PICK

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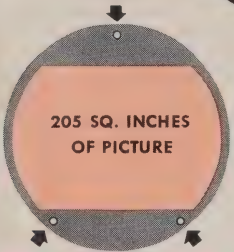

HOW "205" ACHIEVES BIGGEST PICTURE

As its name implies, picture area of "205" is a big 205 square inches. The "205" achieves this maximum utilization of screen area: 1. By photographic printing of tricolor screen directly on inside of curved face. 2. By using a simple, light-weight shadow mask. 3. By positioning the three mask supports above and below the desired screen area . . . where the screen is masked off anyway by the set maker to obtain the desired 4 x 3 aspect ratio. This permits full lateral use of screen.

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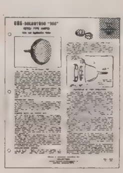
CBS-Hytron 6AN8	Medium-mu triode, sharp-cutoff pentode
CBS-Hytron 6BD4A	Sharp-cutoff beam triode, high-voltage regulator
CBS-Hytron 6BD6	Sharp-cutoff r-f pentode color demodulator
CBS-Hytron 6BJ7	Triple-diode d-c restorer

NEW . . . FREE "205" DATA

Keep abreast of big-screen color TV. Four-page sheet on CBS-Colortron "205," RETMA type 19VP22, contains complete data on: Construction . . . operation . . . application . . . installation . . . adjustment . . . electrical and mechanical characteristics. Write for Bulletin E-227 today!



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A Report on PHONO NEEDLES

by WYN MARTIN

Needle Types . Needle-Groove Contact . Tip Wear
Controlling Problems Caused by Needle Wear

THE IMPORTANCE of the phono needle, or stylus‡, to audio reproducing systems has increased tremendously in recent years. This increased importance has two causes:

(*1*) Modern hi-fi audio systems are better able to reproduce the rattles, buzzes, and other distortions that result, either directly or indirectly, from worn or improperly designed needles.

(*2*) The old-style simple steel needle, which was changed every few playings, has been replaced by assorted types of semi-permanent needles with jewelled or metal tips. Phono users no longer merely ask for needles in purchasing replacements, but must usually specify the cartridges in which they are to be inserted; at the same time the user is faced with a choice as to needle tip material, and he must make a decision as to when to change the needle. Where formerly such a decision may have involved a fraction of a penny, to-day it often involves dollars.

Contact Between Needle and Groove

The tip of a phono needle is not pointed, but rounded at a definite radius of curvature. The needle makes contact with the groove, as shown in Fig. 1, where the bottom of the groove does not touch the tip.

There are three sizes of needle tips in home use: The standard 3 mil (.003″) radius for 78 rpm records, the microgroove 1 mil (.001″) radius for 33 1/3 and 45 rpm records, and the *all-groove* tip, which is truncated rather than spherical. The all-groove phono needle is illustrated in Fig. 2; the contact between the needle and the groove occurs at the corners, and the needle tip does not touch the bottom of the groove in either standard or microgroove records.

Needle Tip Wear

The old-fashioned steel needle was expected to sink into the groove after a few revolutions of the turntable and to form shoulders, as pictured in Fig. 3. This was certainly not very good for the record, the needle, or the quality of reproduction, but reproducing systems were not then as sensitive to the type of distortion created as they are now. Furthermore the situation was not as bad as it would be if a jewelled needle tip with shoulders were used to reproduce a record. As the steel needle turned in the groove its corners could be rounded off by the record, while a hard needle tip with sharp corners would do more damage.

Modern needle tips are generally made of osmium, sapphire, or diamond, these materials being listed in order of their hardness. They, too, wear down, and the *flats* that are created are more serious than the aforementioned wear. There is a direct distortion introduced, caused by the inability of the worn needle to follow the convolutions of the groove as perfectly as when the tip was spherical.

Fig. 4 (p. 60) illustrates the difference in the vibratory path taken by a perfectly shaped stylus tip and the path taken by a tip with a flat worn on one side. This distortion can first be detected as a harshness in the higher frequency components of the record, especially those at high volume, and an increased surface noise. As the flat wears further a more easily defined distortion develops, which could be described as rattling or buzzing, and surface noise increases.

The direct distortion associated with a worn needle tip is not the only effect

(*Continued on page* 60)

(Above)

Needle changing in Webster Electric cartridge where set screws are used to hold needles in place. On older models, control lever is removed by loosening set-screw knob and then removing. Set screw in cartridge is then loosened to loosen needle. To install new needle, procedure is reversed. (Courtesy, Duotone)

Fig. 1 (below). Proper fit between needle tip and record groove. Note that the bottom of the groove does not touch the needle. Needle tip size (1 mil or 3 mil) refers to the radius of curvature.

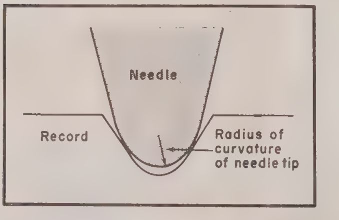


Fig. 2 (right). How an all-groove needle plays both standard and microgroove records without touching bottom of groove.

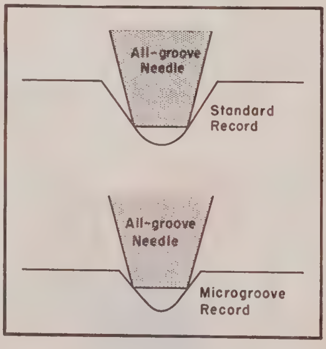
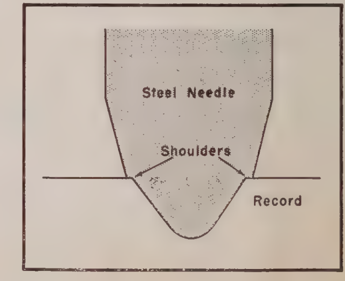


Fig. 3. Shoulders formed on steel needle. The needle sinks into the groove and scrapes the bottom.



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‡Both terms are equally correct according to the American Standards Association.

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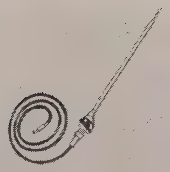
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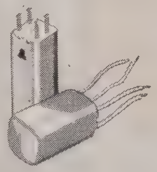
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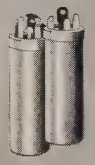
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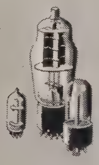
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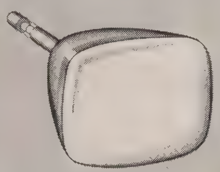
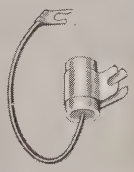

PICTURE TUBES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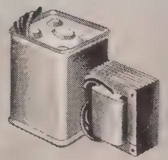
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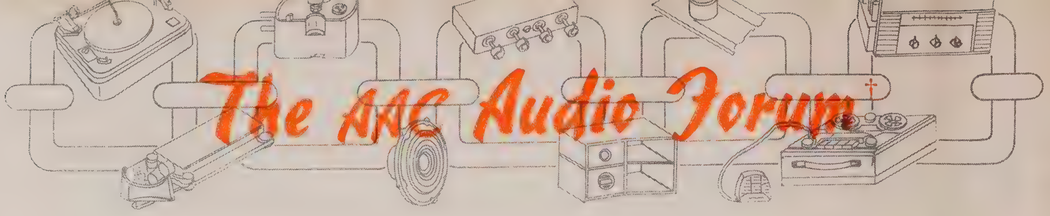


The AAC Audio Forum†

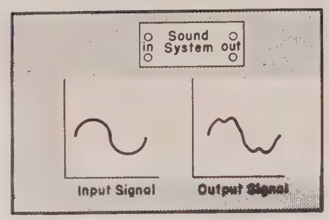


Fig. 1. Harmonic distortion of an input sine wave produced by an element of the reproducing chain.

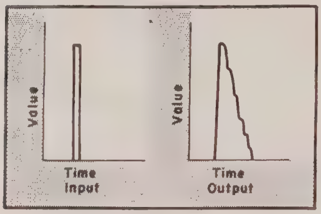


Fig. 2. Deterioration of input transient impulse by an element of the reproducing chain.

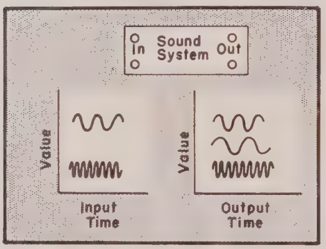
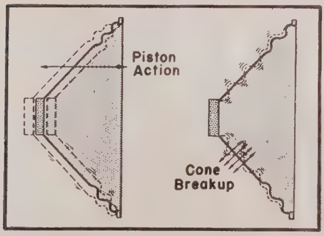


Fig. 3. Intermodulation distortion of an element of the reproducing system which produces spurious frequencies.

Fig. 4. Vibration cycle of a speaker diaphragm, and breakup of a poorly designed diaphragm.



Part II of a Series of Progress Reports*:

Component and System Distortion Factors . . . Role of the Loudspeaker in the Audio Chain

Distortion in audio systems may be due to several factors. In some instances, as illustrated in Fig. 1, the trouble has been caused by an improperly aligned amplifier into which a pure sine wave was fed. This is a condition one must try to avoid. We must strive for purity of output, and true *reproduction of input* rather than production of spurious effects.

Another illustration of what a reproducing system can do to an original tone appears in Fig. 2. A sharp *transient* is shown on the left; a waveform with sharp rise time and sudden decay time. If, however, the system is such that it cannot adequately reproduce or follow a sharp waveform such as this, but reproduces it with a trailing wave form, as shown at right, then these sounds, which normally would sound crisp and sharp and *staccato*, become muddy and barrelly. They do not have the distinctness of the original musical tone. The sharp strike of a wooden hammer on the bars of a xylophone may sound like a soft swipe of a felt hammer on a marimba; the crisp pluck of a guitar string may turn into a slide Hawaiian guitar; or the pedal-damped tone of the piano could continue to *ring* long after the original sound has stopped. These are the effects of poor transient response.

Intermodulation Distortion

Another defect of reproducing systems is intermodulation distortion, as shown on Fig. 3. Intermodulation distortion can occur in any reproducing instrument, whether it be an amplifier, tuner, pickup, or in a loudspeaker, if non-linearity exists in the system. Intermodulation distortion is the production of additional frequencies over and above those which have been fed into the system. Thus, as Fig. 3 shows, the introduction of the two widely separated frequencies (indicated on the left) into a system which, due to non-linearity, introduces intermodulation distortion, reproduces the two original frequencies *plus* some third and, perhaps, more frequencies as shown on the right in the illustration. This is equivalent to, one might say, a violin and a bass violin playing together and giving birth to still another instrument which never existed in the first place. This is intermodulation distortion.

These, then, are some of the types of distortions which can occur in reproducing systems and which one must religiously try to avoid, lest we change the musical color that the original presentation was intended to convey to us. We want the purity of the musical tone; the purity in all of the complexity of the musical tone. We want the sharpness of the response; we do not want any spurious notes which did not originally exist. If these criteria can be obtained in a system, the result will be a musical reproducing system which will be more colorful, more pleasing to the ear, and smoother to our nervous systems.

Unfortunately, the loudspeaker, a key factor in the audio system, has not received sufficient attention from Service Men. Too often we have been

(*Continued on page* 61)

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† Presented as a service to industry, in cooperation with the Audio Activities Committee (through its Promotion and Public Relations Subcommittee) of the Sales Managers' Club, Eastern Division, who have arranged for members of the audio industry to contribute authoritative data on all phases of audio in which they are most expert. Comprehensive articles will contain technical and merchandising information on amplifiers, preamps, speaker enclosures, speakers, turntables, record changers, cartridges, needles, arms and accessories, recording discs and tapes and accessories, tape recorders, special output transformer kits and tuners.

Prepared by* ***Abraham B. Cohen,* *University Loudspeakers, Inc.; based on a talk entitled* ***Putting Color in Sound*** *presented at recent CRTSA color TV symposium in Philadelphia.*

G-C TUNER-KLEEN'R For every Standard Coil tuner. Cleans both stationary and rotary contacts at every twist of the channel selector. Easy to install, means extra profit, better reception.
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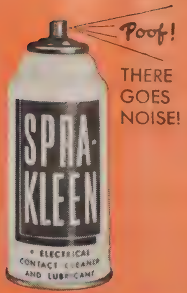
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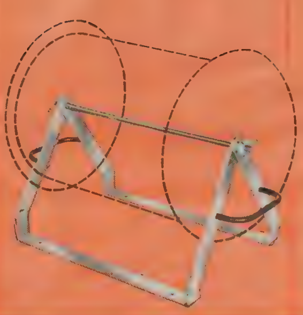

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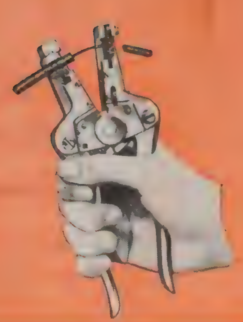

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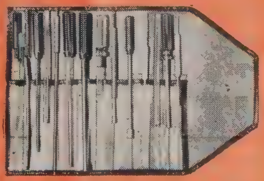

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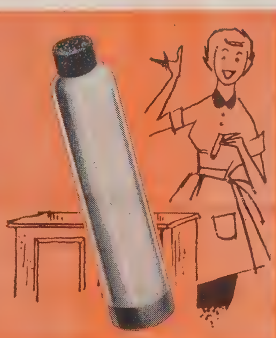

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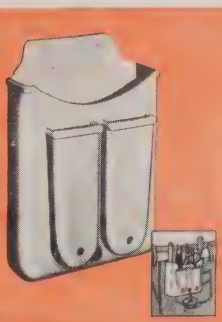

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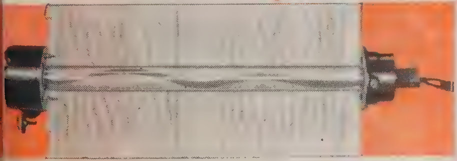

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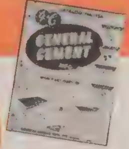

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3 SENSATIONAL New Antennas

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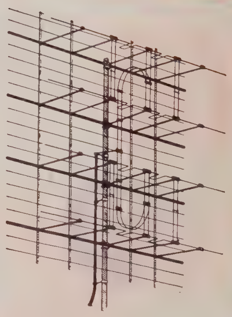
FINCO 400-SA

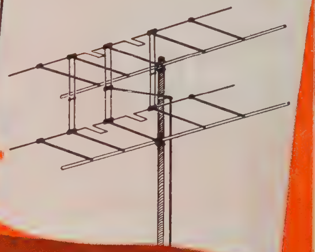
FEATURING "FRO-BAC"* FULL DIMENSIONAL SCREEN

The engineering masterpiece of the antenna industry! The sensational, new Finco 400-SA eliminates rear signal interference (adjacent and co-channel), ghosts and electronic noise — delivers famous Finco high gain for clear, sharp pictures in the SUPER fringe area on all channels, UHF and VHF. The special electronic FRO-BAC screen has 80 sq. ft. of highest efficiency, FULL LENGTH reflector surface. Pre-assembled for quick installation.



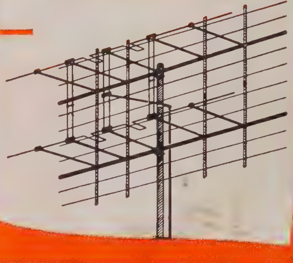
FINCO 200-A

The ideal antenna for "in-between areas" . . . (too far out to use "Local" type antenna, too close to warrant use of a super-fringe antenna). The new Finco 200-A combines basic, double CO-LATERAL* design with exclusive Finco electronic patents to deliver unbeatable gain and performance in the Semi-Fringe area on all channels, UHF and VHF. Completely pre-assembled.



FINCO 200-SA

The Finco 200-SA was engineered specifically for the "in-between", semi-fringe areas where a FRONT-TO-BACK problem exists. The special FRO-BAC full dimensional screen eliminates rear signal interference, ghosts and electronic noise. This antenna delivers reception power that cannot be matched by ordinary antennas. Completely pre-assembled.



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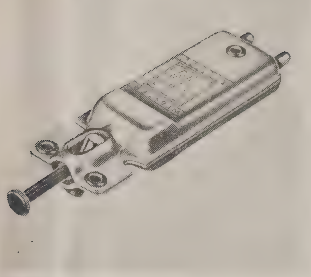
MODEL 14-S CONVERSION KIT

FRONT-TO-BACK PROBLEM IN YOUR AREA??? MANY FINCO 400-A INSTALLATIONS???

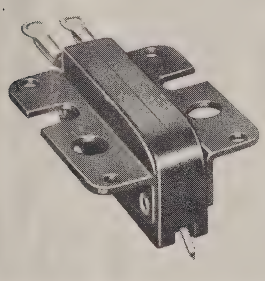
This kit contains special electronic FRO-BAC screen and stainless steel hardware for quick conversion of models 400-A and 400 to model 400-SA.

Latest in Audio

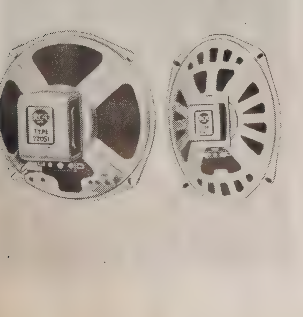


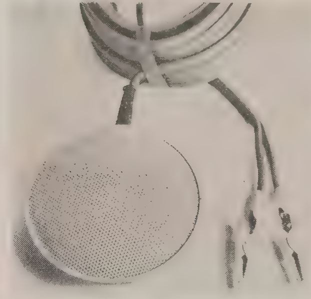
Single-needle dual-voltage cartridge for either 78 rpm or three-speed use. For high voltage applications it develops 5 volts at 78 rpm or 2 volts at 33 1/3-45 rpm. Using shunting capacitor furnished with cartridge for low-voltage use, unit develops .75 volt at 33 1/3-45 rpm or 1.5 volts at 78 rpm. Weighs 7.25 grams. (Model WX; Webster Electric.)

Single needle cartridge, said to develop .6 volt at 33 1/3 rpm and .8 volt at 45 rpm with 7 grams tracking pressure and a cut-off frequency of 10,000 cps. Fits any standard ½" RETMA mounting, RCA 45 rpm or Columbia 33 1/3 players. (Model GX; Sound Sales Division, Webster Electric Co., 1900 Clark St., Racine, Wis. Data in Bulletin Y F4.)



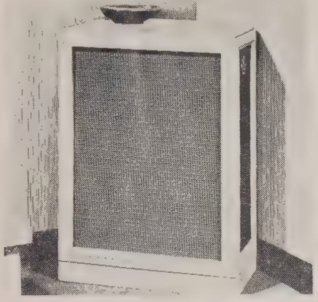
Replacement speakers for home and auto radios and TV chassis. One model is a 6½" pm type, for service in table model radio and TV receivers and in centralized sound systems; other is a 6" x 9" pm type for use in auto radios and home music systems. Both speakers utilize standard RETMA mounting dimensions. First type incorporates a 2.15-ounce Alnico V magnet, a 3.2-ohm voice coil, and a universal flange for mounting a wide range of transformer sizes. Other type has a 3.2-ohm voice coil and an Alnico V magnet weighing 2.9 ounces. (Models 220S1 and 218S1; RCA.)



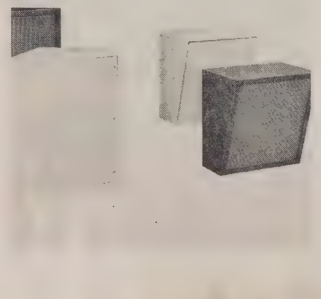


Dynamic speaker, equipped with a 30' cord, that clips to television or radio set speaker terminals, designed to bring sound to hard-of-hearing at normal distance from set. (Wright-Zimmerman, Inc., New Brighton, Minn.)

A two-way system with separate woofer and tweeter. **HF unit handles frequencies above 2000 cycles. An** HF **balance control is located on the side of the cabinet to adust high-frequency response to particular room acoustics and personal preference. Impedance, 16 ohms; power rating, 25 watts.** (Concerto model with P12-NL12" lf and RP-102 hf units: Jensen Manufacturing Co.)



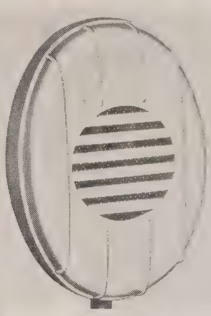
Bass reflex corner baffles featuring a woven plastic grille which covers entire front of the baffle except for a narrow edge. A full-size piece of hardboard under the grille cloth is cut for the proper speaker opening. Hardboard is said to offer advantages over plywood in that it is not subject to warpage and has better acoustical properties. Available in seven models for 4" and 5", 6", 8", 10" and 12" speakers. (Models WB-4/5A, WB-6A, WB-8A, WB-10A, WB-12A, CB-8A, and CB-12A; Argos Products Co., 4753 N. Broadway, Chicago 40, Ill.)



SHURE
SHURE
SHURE

Trio of crystal cartridges claimed to replace 210 cartridge types. One is a Dual-Volt, Dual-Weight model designed to replace steel or aluminum case cartridges, of either high or low ouput; next is a Muted-Stylus Dual-Weight cartridge (dual weight is said to make it possible to replace either aluminum or steel case cartridges, without adjusting tone arm balance). Third model uses pin jacks to eliminate threading of leads through tone arm. (Models W78, W68 and W70; Shure Brothers, Inc., 225 W. Huron St., Chicago 10, Ill.)

Ceramic and **crystal** hand **microphones,** housed **in plastic cases. Output of the crystal model said to be—46 db; ceramic, —53 db. Frequency range of the former is 30 to 10,000 cps, while the range of the ceramic is 30 to 8,000.** (Model M101 and M102; Astatic Corp., Conneaut, O.)



Phono repair service kit designed to help the Service Man increase his sales of phono and replacement parts. Features hinged clear plastic box, in which replacement cartridges can be placed, and cartridge replacement chart, plus gummed labels for Service Man's identification and phone number. Labels can be wrapped around each cartridge installed in the serviced phono as a permanent reference for the customers' future needs for repairs. (American Microphone Co., 370 S. Fair Oaks Ave., Pasadena 1, Calif.)

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Automatic Control of Audio Level in Auto Radios...TV Line-Voltage Control ‡*

SERVICING HELPS

by T. L. GILFORD

AUTOMATIC volume control or electronic control of the audio level of a program has been sought for a long time for auto radios.

In the past, such control of gain based on the variations in strength of the received signal, has been applied to the *rf* portions of the radio circuit only, and the resulting control of the audio level often has been only partial. This type of control might best be termed automatic gain control, rather than the common designation of *avc*. Now, it has become possible to combine the gain and volume control to provide a substantially flat level of output at any listening volume; Fig. 2[1].

To achieve such control of the audio levels electronically in auto radios, where signal strengths vary considerably with stations and with locations, tube engineers* in cooperation with set company engineers[1] have designed and developed a miniature variable mu pentode. This tube, used in the driver stage of the audio aamplifier, has a variable bias supplied to the grid varying the gain or amplification of this stage inversely as the bias supplied. This voltage, obtained from the demodulator and proportionate to the received signal, as in a conventional *avc* circuit, serves to maintain the input to the audio amplifier essentially constant.

Line Voltage Stabilizers‡

IN THE DISCUSSION of the construction of static-magnetic voltage stabilizers, which operate on the constant voltage principle, last month, it was reported that the primary of the stabilizer is connected across the normal 115 *v* line through a normally open relay. However, the inrush current of the set causes the relay to become energized, closing its contacts and thereby placing the primary of the stabilizer across the 115 *v* line, and its secondary across the input to the television receiver.

The secondary is loosely coupled to its primary with a magnetic shunt. The inductance of the secondary coil and the capacitance of the capacitor across the coil form a tank circuit which is tuned to resonance. This resonant circuit develops maximum current which saturates that part of the transformer core. Since the core section is saturated, the secondary will not fluctuate with fluctuations in the primary, but will remain constant. The device will not only regulate gradual line voltage swings, but also the transients which are primarily responsible for *picture jitters*.

How does the TV set owner feel about the need for correcting voltage input to TV receivers?

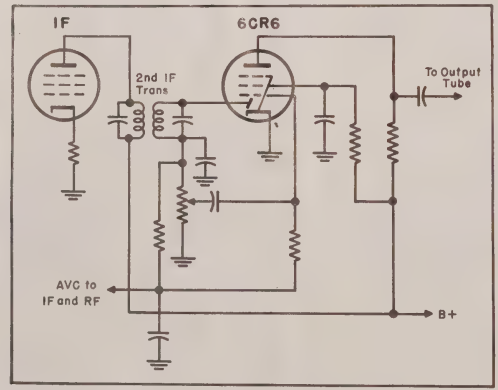
There *is* a definite need for voltage stabilization. That need is not governed by a desire for fine reception quality. It is simply a question of whether or not the receiver will operate.

To test the awareness of the average TV set owner to poor line voltage effects on performance, a TV voltage research study[2] was conducted in a small community in Northern Illinois. Line voltage, supplied by a municipally owned power plant, was known to be poor here.

The conclusions of the test showed that most TV viewers were not too critical of picture quality. They were, however, severely critical of poor performance such as loss of horizontal and vertical hold and *very* poor video and audio. They were not too concerned about below average focus, contrast and linearity until these conditions became extreme.

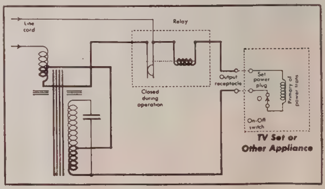
It was concluded from this study that TV reception was, on the main,

(*Continued on page 72*)



(Right)
Fig. 1. Schematic of Sola TeleVolt.

(Left)
Fig. 2. Circuit of Motorola volumatic system.



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[1] Motorola *Volumatic.*

**Tung-Sol.*

[2] By *Sola* engineers.

From notes supplied by **Albert Arnold, Motorola auto radio engineer.*

*‡Prepared by **Sidney Clayton** in cooperation with the engineering department of the Sola Electric Company.*

HEAR THE DIFFERENCE!

Based on the famous University model WLC Theater System used so successfully and extensively in deluxe stadium and outdoor theater installations . . . auditoriums, expositions, concert malls and other important applications where only the highest quality equipment is acceptable—University engineers now bring you a smaller, compact version—the BLC—for general application in public address work. The BLC is the New standard for both voice and music, indoors and outdoors. The BLC is now yours, at the low *low* price of

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FULL RANGE
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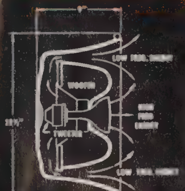
SPECIFICATIONS

Response	70-15,000 cps
Power Capacity	25 watts
Impedance	8 ohms
Dispersion	120 degrees
Mounting	180° adjustable "U" bkt.
Dimensions	22½" diameter, 9" depth



Ask your distributor for a convincing demonstration, and HEAR THE DIFFERENCE!

More Efficient: DUAL RANGE THEATER TYPE SYSTEM permits uncompromising design of the "woofer" and "tweeter" sections for greatest efficiency. Hear it penetrate noise with remarkable fidelity and intelligibility.

Less Distortion: SEPARATE LOW AND HIGH FREQUENCY DRIVER SYSTEMS with electrical crossover reduces intermodulation and acoustic phase distortions common to other systems which attempt to use two different horns on a single diaphragm.

Better Lows: BALANCED "COMPRESSION" TYPE FOLDED HORN, starting with eight inch throat and energized by top quality low frequency "woofer" driver provides more lows than other bulky designs.

Better Highs: DRIVER UNIT TWEETER with exclusive patented "reciprocating flares" wide angle horn transmits more highs with greater uniformity . . . high frequency response that you can *hear!*

More Compact: EXCLUSIVE WEATHERPROOF DUAL RANGE COAXIAL DESIGN eliminates wasted space. Depth of BLC is only 9"; can be mounted anywhere, even flush with wall or ceiling.

More Dependable: EXPERIENCED MECHANICAL ENGINEERING AND CAREFUL ELECTRICAL DESIGN meet the challenge of diversified application and environmental hazards. Rugged, and conservatively rated—you can rely on the BLC.

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DIAMONDS ARE YOUR BUSINESS!

DIAMOND—KNOWN AND TREASURED FOR 2,500 YEARS—HAS ONLY TWO CONSUMER USES: ONE IS JEWELRY, THE OTHER IS THE PHONOGRAPH NEEDLE!

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AS OF 1954, OVER $30,000,000 WORTH OF DIAMOND NEEDLES WERE BOUGHT BY AMERICAN RECORD COLLECTORS.

ARE YOU GETTING YOUR SHARE OF THE DIAMOND NEEDLE BUSINESS? WRITE TODAY FOR COMPLETE DETAILS.

REPRINTS OF ARTICLES ON RECORD AND STYLUS WEAR AVAILABLE UPON REQUEST.

Diamond Phonograph Needles by...

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World's Largest Manufacturers of Diamond Styli

Phono Needles

(*Continued from page* 50)

created, or even the worst effect. The record groove itself can become permanently damaged, so that future playings, even with a new needle, will still be distorted and will have increased surface noise.

Measures Taken Against the Effects of Needle Wear

The distorted reproduction and excessive record wear described must of course be prevented as much as is possible. Two things can be done; the conditions of use can be made such that needle and record wear is no greater than it has to be, and needles can be replaced before they are able to do significant damage.

Needle tip wear is the direct result of friction with the record groove, and it is to be expected that the greater the vertical force on the needle the greater will be the wear. Phono cartridges, however, must have a certain amount of weight on them. Needles are subject to lateral forces pressing against the sloped groove walls and tending to unseat them, and unless a certain minimum vertical force is maintained the stylus will lose momentary contact with the groove walls, or actually jump the groove.

The cartridge manufacturer specifies the weight required on the cartridge during play, usually in grams, as *tracking force.* A phono pickup should never be installed with less than the rated tracking force, because distortion will be increased, there will be a danger of groove skipping, and record and needle wear can be *increased* by the nature of the intermittent contact between needle and groove wall. Tracking force can be measured by a gauge.

It is better, as a matter of fact, to use a tracking force which is slightly high, than one which is slightly low, especially in high-fidelity systems, as the intermodulation distortion resulting from insufficient weight on the pickup sets in rapidly with low tracking force and is very annoying. Where a manufacturer specifies a tracking force of, let us say, *6—8 grams,* it has been found that the higher figure is best, possibly with an added gram for good measure. This added force is insignificant in comparison with many installations where the tracking force has been found to be double what it should be.

A second condition which keeps record and needle wear to a minimum is the maintenance of clean records,

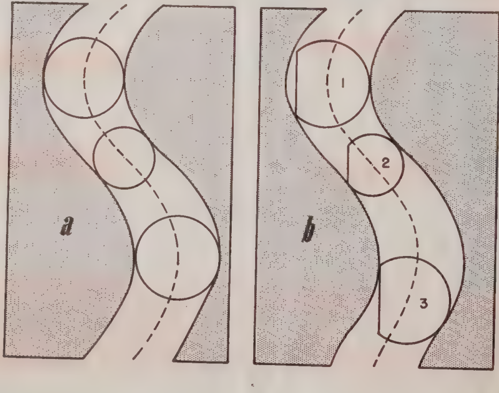

Fig. 4. A = top view of record groove, with cross-section of spherical needle tip at point of contact between needle and groove. (The different sizes of the cross-sections represent the rise and fall of the needle caused by pinch effect.) The path traced by the center of the needle, shown in dotted line, is an almost exact replica of the groove shape. B = same view, with worn flat on needle tip. The path traced by the center of the needle is no longer accurate: position 2 is the same as the corresponding position in (A), but the center of the needle is shifted in positions 1 and 3. In addition, the sharp corners may cause permanent record damage.

wiped free of dust and dirt, and handled by the rims to keep dust-attracting body oils from the grooves. The needle tends to grind foreign particles into the record material, a process that wears both needle and record more than normally.

[Next Month: Needle Changes, Assemblies, and Types]

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Audio Forum

(*Continued from page* 54)

prone to consider the speaker as simply something which has 3.2 or 8 ohms impedance, or is 6″ or 12″ across the face. Actually, the loudspeaker is perhaps one of the most intricate components in the whole reproducing chain, even though, appearance wise, it may seem to be nothing but a piece of paper vibrating in free air. The fact is, the loudspeaker obeys just as much the laws of physics as the amplifier obeys the laws of electronics, and the motor generator set obeys the laws of electricity. Good loudspeaker design revolves almost entirely on the rigidity of the basket, the strength of the form on which the voice coil is wound, the mechanical and acoustical stability of the diaphragm, the configuration of the magnetic circuit in which the voice coil rides, holding qualities of cements and similar matters. At most, there are only a few feet of copper wire wound on the voice coil and this is actually the only electrical component of the loudspeaker. The rest is purely magnetic and mechanical.

Perhaps the most important feature of the loudspeaker, mechanically speaking, is the diaphragm or the cone, as it is more popularly known. There are hundreds and hundreds of patents owned by manufacturers of just speaker cones, which deal with the paper pulp ingredients which go into the making of these paper cones; there are numerous patents concerning paper cone shapes and the manner in which the cones are made. This stream of patents attest to the fact that just as much research is involved in modern loudspeaker design, as is required for the most complex vacuum tube. We can no more divorce the loudspeaker as an instrument of precision from the general train of reproducers, than we can forget the problem of matched tube characteristics or the output characteristic of a transformer.

Now how does the loudspeaker produce sound? It makes music in the same way as a musical instrument produces sound, with the diaphragm

(*Continued on page* 62)

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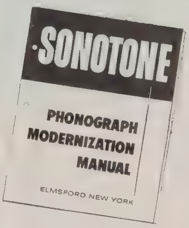

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Audio Forum

(*Continued from page* 61)

vibrating back and forth to produce a cycle of alternating air pressure radiating from the cone. Fig. 4—p. 54 (left) shows such cone vibration, in and out of its basket, producing a pulse and air pressure rarefaction, in front of it which, in essense, is a wave of sound radiating from the diaphragm. Now this diaphragm, of course, is very light in nature and very thin in cross section. In its vibration, it may have a tendency to distort or *break up;* Fig. 4, right. Such *break-up* is characteristic of loudspeakers and diaphragms which are designed improperly and cannot carry the complex, sudden vibrations imparted to them by the true input signal. Cone *break-up* is characterized by a very unmusical sort of *cry* in the mid range of the reproducing range of the loudspeaker. When it occurs, it adds to the sound originally produced, altering the complexity of the tone by spurious vibrations which changes the original color of the tone. The true tone is marred and smeared, as it were, with a dirty paint brush. This is only one typical problem in design that must be met adequately in the manufacture of good loudspeakers.

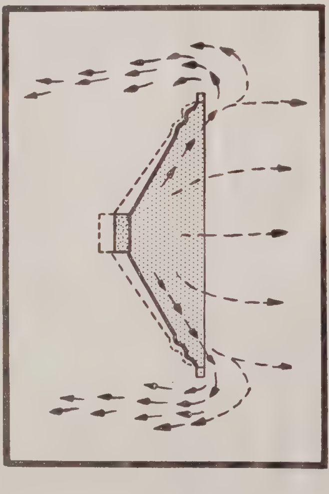
But there is more to reproduction than just a good loudspeaker. A loudspeaker, by itself in free air and unbaffled, is not a good reproducer. We have all noticed that whenever a speaker is simply put on the bench unbaffled (for sake of expediency) and connected to an amplifier, it does not sound right. It does not have the proper low frequency response, and lacks proper balance of highs to lows to provide good musical reproduction. We all know that the speaker must be baffled in some way for proper performance. Lately, there has been a great interest in baffles or enclosures. (An enclosure is something into which we put a speaker.) Now why does one put the speaker in an enclosure? Fig. 5 shows a speaker completely without baffling, radiating sound into space. In acoustics, we have the same circuitry as there is in electronics and electricity; there are short circuits, open circuits, shunts and series circuits. We have the same general formula to solve for acoustic circuits as we do for any other type of circuits. In the speaker shown, there is no barrier preventing the sound from sweeping around from the front towards the back. The speaker is practically short-circuited on itself, acoustically speaking, and being short-circuited itself, there is a lack of power radiated into space, especially on the low frequencies.

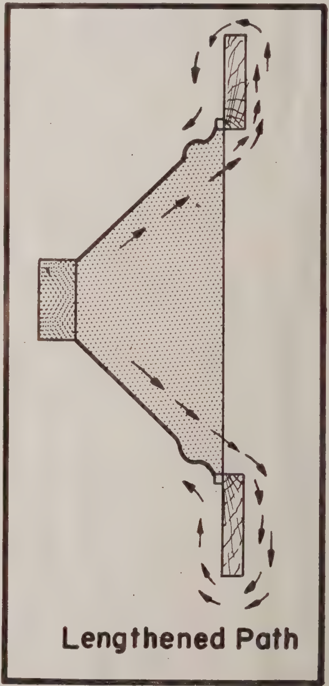
How can we prevent such a short circuit? Let us examine Fig. 6, which illustrates the use of a small baffle,

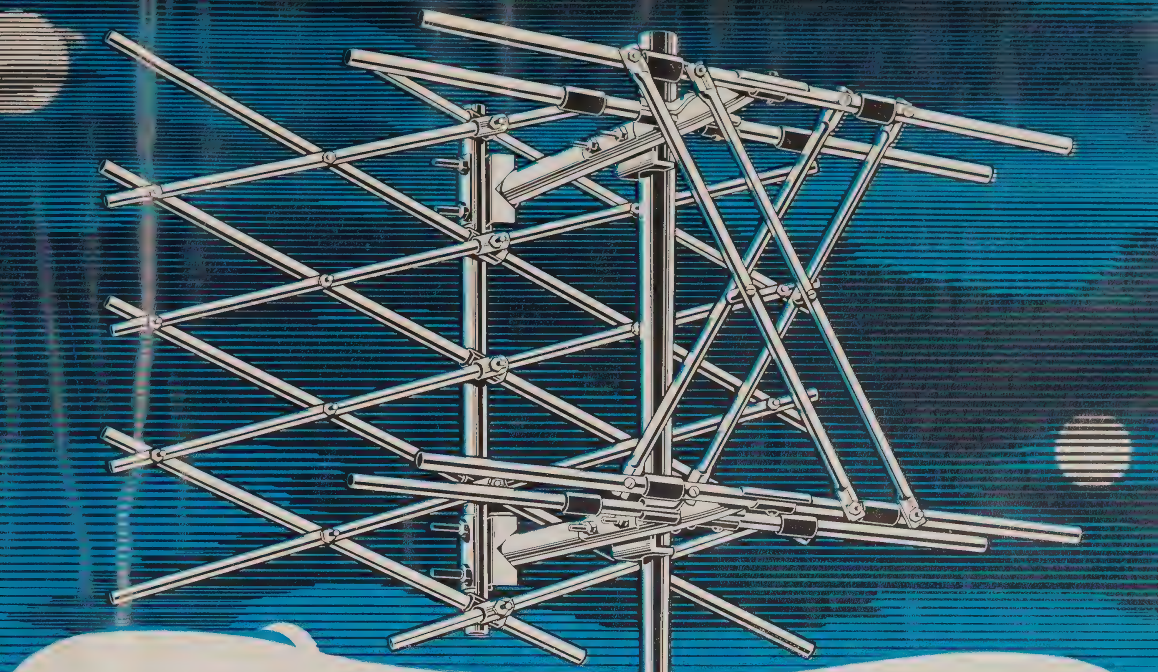
(*Continued on page* 64)

(Below)
Fig. 5. Speaker baffling, illustrating how an unbaffled speaker short circuits its acoustic output upon itself.

(Right)
Fig. 6. How a small flat baffle prevents acoustic short circuiting of the speaker by a small degree.







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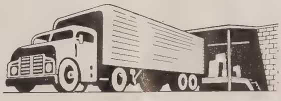

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Audio Forum

(*Continued from page* 62)

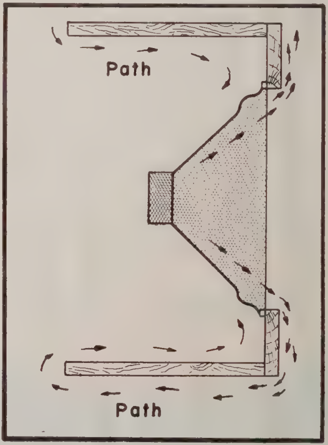
such as many of us have used many times. A speaker is mounted simply on a small board and hung up in the corner of the shop to serve as some sort of a monitor. Such an installation provides better sound than a speaker sitting on the bench. Why does it sound better? A longer distance has been introduced for the sound from the front to get around to the rear before it can cancel itself out. We have baffled the sound, put something in its way, and removed some of the short circuit.

An even longer baffle is shown in Fig. 7. Again, the short circuit has been removed even more and we get into more reasonable circuit constants, where the loudspeaker has a reasonable load into which to work, and where it can develop radiated power without being shorted. This particular baffle is typical of many found on the market today. It is, perhaps, the simplest type giving fair reproduction, but it is not a good baffle in any sense of the word. Full utilization of the speaker is made impossible by this sort of open baffle. There are other types, such as the bass reflex, horn-loaded type of cabinets, or other specialized designs that insure better results. All of these baffles have one primary purpose; to provide good low-frequency loads for the loudspeaker. It is the proper functioning of the baffle in the low-frequency end which adds to the full-bodied reproduction of music, and if this baffle is inadequate, then reproduction will suffer.

The open back type of baffle found today on many TV sets does not seem to provide the adequate results which should obtain from the *hi-fi* FM signals sent out. The output sections of many TV models have single stage outputs and use a small utility type of output transformer, which cannot do full justice to the full fidelity of which the TV-FM sound is capable. In such installations it is very desirable and profitable for the Service Man to improve the receiver's sound or to give birth to the desire for better sound. Knowing all of the characteristics of the reproducing elements that enter into the good design of loudspeaker *systems* simplifies such an assignment. Let us now examine the major element in the system, the loudspeaker.

Well-balanced and full-bodied music can be obtained in the concert hall by an ample and adequate orchestra; so in the reproduction of music, good reproduction calls for adequate and capable loudspeakers. In many ways, the selection of loudspeakers for high-fidelity installations should be made on the same basis as the organization of an orchestra; as, for instance, in the number of musicians the budget

Fig. 7. A long open back baffle, as shown here, is a better acoustic load than a short baffle, but still is not optimum baffling.

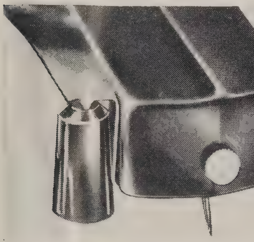


will allow and the size of the hall that the orchestra can hold. The choice of a loudspeaker or a loudspeaker system depends on similar factors:

(*1*) The range of the instrumentation that one desires to reproduce.

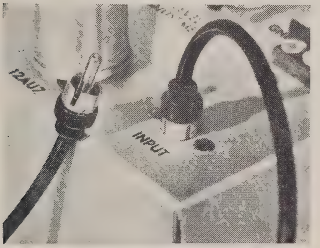
(*2*) The budget allowed to build this acoustic orchestra to reproduce the music,

(3) And the size of the *hall* of the enclosure into which this loudspeaker or the loudspeaker systems are to be installed.

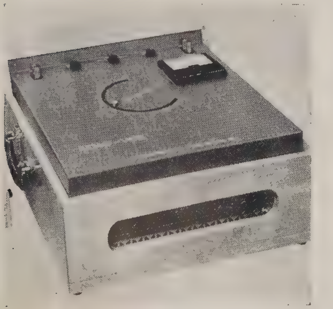


Device designed to neutralize dust collected on record. (Stati-Mute; Eby Sales Co. of N. Y., 130 Lafayette St., N. Y. 13.)

Audio connectors with molded-on insulation to protect soldered joints. (Supplied with 3′, 5′ and 7′ lead lengths; V and H Sales Co., Long Hill Branch, Bridgeport, Conn.)



Variable of time delay which can be used to phase speakers in auditorium, stadiums, and other large areas, where objectionable echoes exist. Opposite effect also may be obtained, especially where introduction of a slight echo would greatly enhance the acoustical properties of the area. By exaggerating time delay, interesting effects are obtainable for broadcast studios, recording purposes, etc. Frequency response: 40 to 12,000 cps. Input impedance is 600 ohms; choice of 600, 8 and 3.4 ohms for output impedance. Output power: 25 watts maximum for speaker drive. (Echo-Vox; Kay Electric Co., Pine Brook, N. J.)



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The W68 is a "Muted Stylus" type, Dual-Weight Cartridge. The dual weight makes it possible to replace either aluminum or steel case cartridges—without adjusting tone-arm balance. With weight slug net weight is 25 grams; without weight slug net weight is 12 grams. The W68 is equipped with the famous A62A silent-tracking, "Muted Stylus" needle.

STANDARD CARTRIDGE FOR 78 RPM RECORDS

MODEL NO.	TYPE	LIST PRICE	OUTPUT LEVEL	MIN. NEEDLE FORCE	RESPONSE TO	NET WT.	SHURE NEEDLE NO.
W68	Crystal	7.50	1.6V	1 oz.	4,500 c.p.s.	Dual Weight 25 grams or 12 grams	A62A

The MODEL W78
replaces 149 Cartridges made by the five leading manufacturers.

Model W78 is a Dual-Volt, Dual-Weight Cartridge—so versatile it replaces 149 other cartridges! This cartridge alone will become a sensation overnight—because it replaces steel or aluminum case cartridges, of either high or low output! The W78 provides the broadest coverage at the lowest investment—only $5.55 list.

General Information: With weight slug, net weight is 25 grams; without weight slug, net weight is 12 grams. In addition, Model W78 has a capacitor, furnished as an accessory. Without capacitor, output is 4.0 volts; with capacitor, output is 2.0 volts.

STANDARD CARTRIDGE FOR 78 RPM RECORDS

MODEL NO.	TYPE	LIST PRICE	OUTPUT LEVEL	MIN. NEEDLE FORCE	RESPONSE TO	NET WT.	SHURE NEEDLE NO.
W78	Crystal	5.55	4.0V or 2.0V	1 oz.	6,000 c.p.s.	Dual Weight 25 grams or 12 grams	None

The MODEL W70
replaces 20 "Special" Cartridges.

Model W70 is a completely new cartridge in the Shure line. It replaces all the Webster "CX" and "C" Series Cartridges, comes equipped with all the necessary accessories. The W70 is more than an adequate replacement: it is an improvement, because it uses pin jacks—doing away with laborious "threading" of leads through the tone-arm.

ALL PURPOSE SINGLE NEEDLE CARTRIDGE FOR 33⅓, 45, 78 RPM RECORDS

MODEL NO.	TYPE	LIST PRICE	OUTPUT LEVEL	MIN. NEEDLE FORCE	RESPONSE TO	NET WT.	SHURE NEEDLE NO.
W70	Crystal	4.95	3.0V 3.8V	10-15 grams	5,000 c.p.s.	16 grams	None

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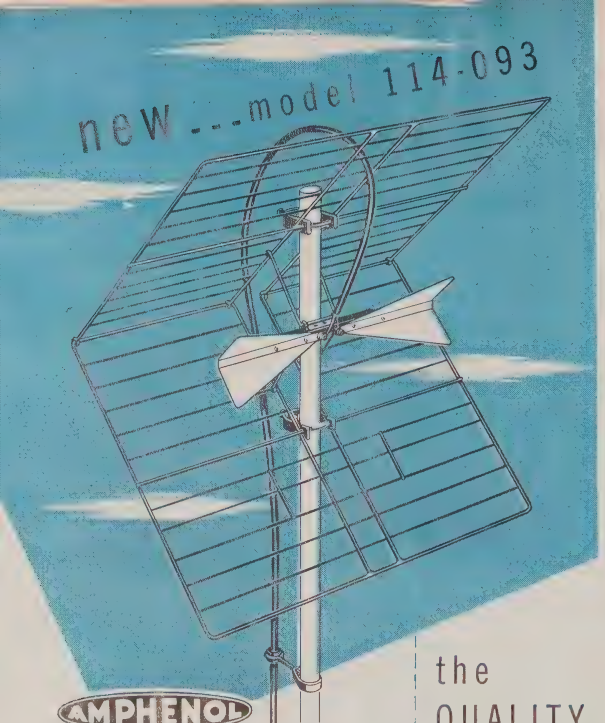

AMPHENOL

LIGHTWEIGHT UHF

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The electrical characteristics of the new LIGHTWEIGHT Corner Reflector are excellent. The gain rises from 8 db to 12½ db across the UHF channels, more than enough gain to provide sharp, clear pictures in weak signal areas. Directivity, as on all AMPHENOL antennas, is exceptionally fine. There is one strong forward lobe that makes antenna/station alignment easy for the installer.

With the addition of the LIGHTWEIGHT Corner Reflector to the AMPHENOL line of quality antennas, AMPHENOL now offers every installer a quality choice of UHF Corner Reflectors—the new 114-093 LIGHTWEIGHT and the "king-size" model 114-058 Corner Reflector, previously in production.

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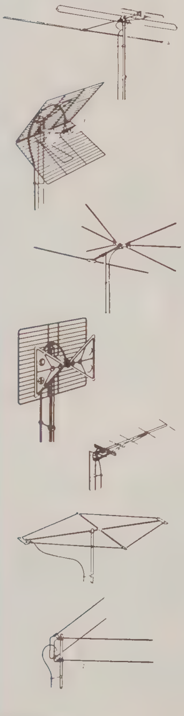


AMPHENOL

Associations

FRSAP

Educational Programs, Anti-Bait Advertising, and Price Rate Schedules, have been highlighted at recent meetings of the Federation of Radio Service Men's Associations of Pennsylvania.

Group's educational chairman, *Art Guild,* of Williamsport, detailed a service course plan for upgrading of Service Men in each chapter. It was reported that local groups would ask the cooperation of the Board of Education or local trade schools, to help them begin the service course series.

An anti-bait advertising ordinance, which can be submitted to local municipalities for enactment, as well as forms and procedure outlines which could be used when investigating misleading service ads, were also described at a meeting. Chapter reps were also given instructions on how to forward names of those who ignore City, State and Federal tax and business requirements to local State sales tax offices, mercantile or business tax headquarters and income tax bureaus.

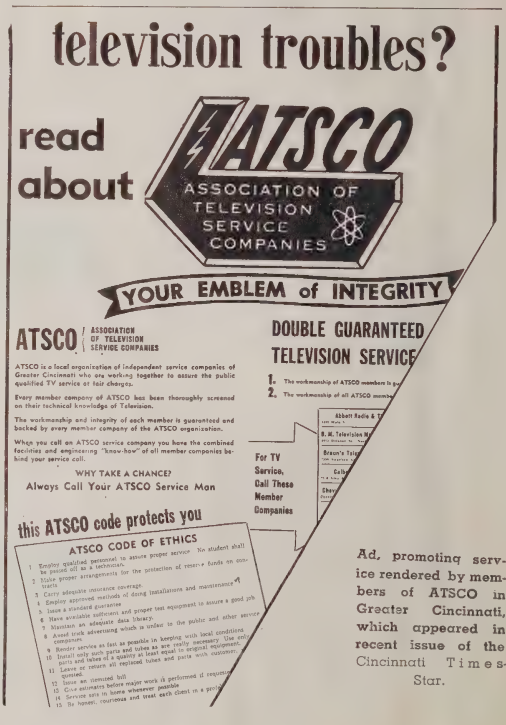
Wilkes-Barre area group reported on a local price-rate schedule as a result of a survey made throughout that city. Copies of the report were given to delegates from other chapters for further study and possible use in their respective areas.

* * *

RTG, L. I.

In a recent issue of *The Guild News,* published by the Radio Television Guild of Long Island, *Jack Wheaton,* ESFETA prexy, discussed the association's place in the electronics industry, and the ultimate goal of associations.

Wheaton felt that . . . "the most important goal to be accomplished is an adequate presentation of the problems concerned in radio and TV service to the consumer, for



television troubles?

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When you call on ATSCO service company you have the combined facilities and engineering "know-how" of all member companies behind your service call.

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ATSCO CODE OF ETHICS

1. Employ qualified personnel to assure proper service. No student shall be passed off as a technician.
2. Make proper arrangements for the protection of reserve funds on contracts.
3. Carry adequate insurance coverage.
4. Employ approved methods of doing installations and maintenance.
5. Issue a standard guarantee
6. Have available sufficient and proper test equipment to assure a good job.
7. Maintain an adequate data library.
8. Avoid trick advertising which is unfair to the public and other service companies.
9. Render service as fast as possible in keeping with local conditions.
10. Install only such parts and tubes as are really necessary. Use only parts and tubes of a quality at least equal to original equipment.
11. Leave or return all replaced tubes and parts with customer, quested.
12. Issue an itemized bill
13. Give estimates before major work is performed if requeste
14. Service sets in home whenever possible
15. Be honest, courteous and treat each client in a prof

Ad, promoting service rendered by members of ATSCO in Greater Cincinnati, which appeared in recent issue of the Cincinnati Times-Star.

John Q. Public has been sadly in ignorance, and sometimes deliberately misinformed as to what to expect from the equipment he uses."

Jack viewed the Service Man as a great influence on possible sales, and repeat sales of a product, as well as brand loyalty.

Wide-scale consumer education, he continued, could best be obtained by a national group, and also by state groups on a regional level, with the local association coordinating the two to see that the best benefits are being derived from both programs.

An exchange of information, between manufacturers and Service Men, was also emphasized by Wheaton. Keeping the men in service well informed on new developments, via lectures, is of primary importance, he said. Much has been done, but much more still can be done.

* * *

ECTRA

A 5-POINT code of ethics, of the newly-formed Erie County TV Radio Association, Erie, Pa., was outlined recently by *P. O. Ferra,* president.

Group aims to guarantee its radio and TV work for 90 days from date performed and replacement parts for 90 days from date installed; use only parts of recognized quality; charge no more than list price for parts; keep charges for labor fair and reasonable; and perform only such repair work as is necessary or authorized.

TEN YEARS AGO

AN ORDER prohibiting the manufacture of any replacement parts, except for Victory line, was revoked. Limitation order L-76, curtailing tube production, was also lifted. . . . The issue featured analyses of converters, electronic production testing devices, instruments and automatic record changers. . . . Front cover contained a diagram of a vacuum-tube voltmeter (*Meissner Analyst*), using a 6E5 magic eye as an indicator and a bias pot calibrated directed in voltage. . . . *Harry Byrne,* ad manager for John Meck Industries, discussed the Service Man's future in receiver sales. He pointed out that Service Men have a golden opportunity to turn a service call into sales calls. . . . *Philip M. Pritchard* was promoted to manager of equipment tube sales for the east central division of Sylvania Electric. . . . *Samuel Ruben* was awarded a Certificate of Appreciation from the War Department for extraordinary contributions to the war effort, and primarily in recognition of his invention of a new dry battery. . . . *Ray R. Hutmacher* was named district manager of the Meissner Manufacturing Co. . . . *E. G. Shalkhauser,* Radio Manufacturing Engineers Inc., was elected chairman of the Electronic Products and Equipment Manufacturers Association. Others elected included: *J. A. Berman,* Shure Brothers, vice chairman; *H. A. Staniland,* Quam-Nichols, treasurer; and *J. Arthur Kealy,* executive secretary pro-tem.

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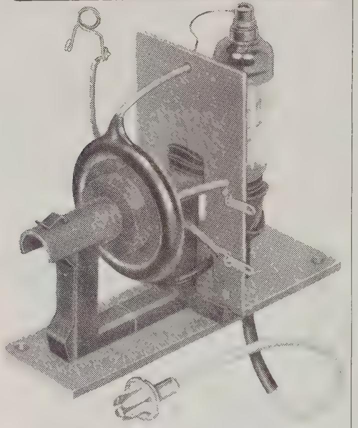

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QUALITY Transformers SINCE 1913

Color Sweep Checks

(Continued from page 26)

left-hand portion of the sweep has better flatness at low frequencies, it is advisable to tune the generator to utilize this sweep, rather than the right-hand sweep.

Gain Checks of Other Video Circuits

Proceeding with the gain checks, the gain of the *Y* amplifier in shown in Fig. 8; note the substantial ringing of the 1-microsecond delay line. A gain check of the second chroma amplifier is illustrated in Fig. 9, and in Fig. 10 the result of a similar check in the *I* demodulator circuit is shown. One must be careful not to be misled by the use of the term *demodulator* in this regard, because conventional demodulating action does not take place; instead, AM-FM discriminating action is taking place in a linear circuit.

A gain check of the *Q* demodulator is illustrated in Fig. 11, and Fig. 12 shows the gain of the *I* amplifier. Gain of the red matrix is shown in Fig. 13. (Figs. 8 to 13 are on page 26.)

[Next Month: I-Q Demodulator-Operation Analysis]

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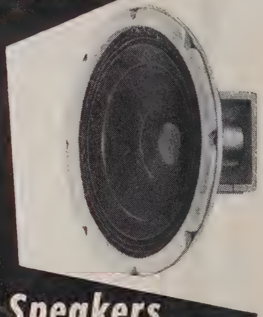

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Ser-Cuits

(*Continued from page* 34)

output of the generator to the *uhf* antenna terminals of the converter. The output of the converter is connected to the generator's *vhf* input jack. The converter and generator are set to the frequency at which the measurements are to be made, the generator being carefully adjusted for a peak-output meter reading. The meter switch in the *uhf* position will indicate the output of the signal generator, while in the *uhf* position the output of the unit under test will obtain. Thus, by noting the difference between the input and output signals, the gain may be inferred.

In the next step, the *vhf* gain control (calibrated in voltage and db) must be set at 1 (*0* db). With the meter switch in the *vhf* position, the *uhf* control is then advanced until the meter indicates *100*. The meter switch can then be thrown in the *uhf* position, and the *vhf* gain control readjusted for the previous meter reading, i.e., *100*. The difference between the original setting of the *vhf* gain control (*0* db) and the new setting required to bring the meter back to *100* represents the gain or loss of the converter under test. The ratio of the meter readings is also a rough indication but, as stated previously, due to the nonlinear characteristics of the crystal, such indication is approximate. As an example, if the meter read *100* with the meter switch in the *vhf* position and the *vhf* gain control set at *1;* and the meter dropped to *50* when the switch was set in the *uhf* position, a voltage gain of *2* or *6* db would be indicated. This would be the ratio of the *uhf* input signal (*50*) to the converter necessary to produce a reading of *100* at the output of the converter. This can be verified by setting the *vhf* gain control at *2* and noting that the meter reading remains the same in both the *vhf* and *uhf* switch positions. This holds true, since the *vhf* gain control has reduced the input to the meter by a factor of *2*.

Antenna gain, as referred to a dipole, can be measured by connecting the dipole to the *uhf* output jack of the generator and a similar antenna to the *uhf* antenna terminals of a converter.

The most obvious application of the generator is in aligning tuned circuits. Here its output is coupled to the tuned circuit and the trimmers and padders are adjusted for the desired response as recommended by the manufacturer.

Since the output meter is independent of the generator, it can be used in conjunction with an external generator or other signal source to indicate the presence of a voltage.

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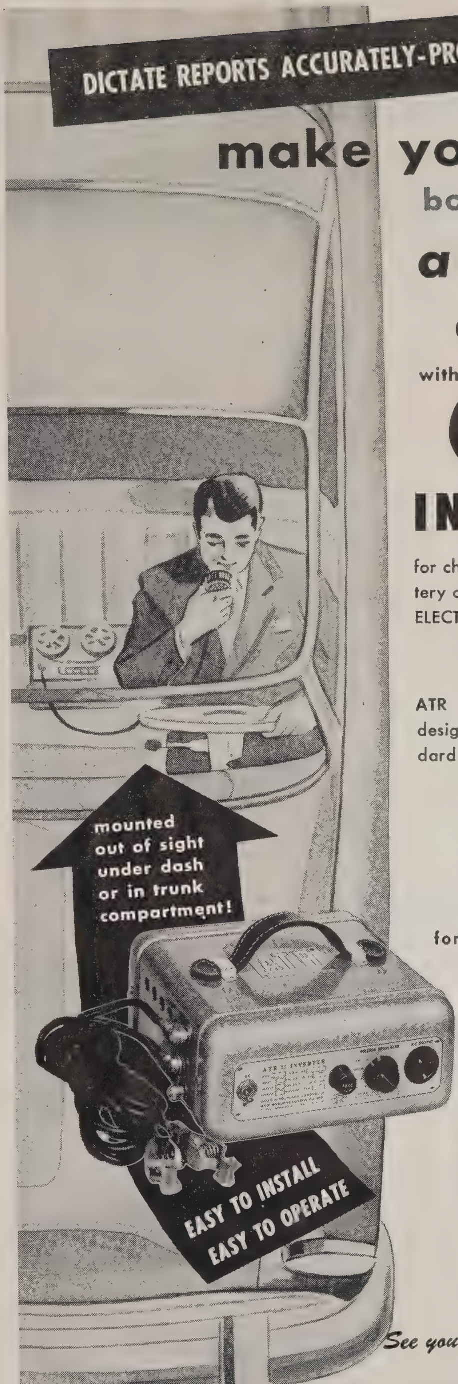
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Radio and TV Department, General Electric Company

Concluding Installment of Philadelphia CRTSA Color Symposium Report on G. E. Color Model: Dual AM Detector Operation . . . Matrixing . . . Sync System Performance . . . High-Voltage . . . Convergence Controls

In the G.E. color chassis, a pair of AM detectors are used. One serves to recover *B-Y* chroma components, and the other, *R-Y* chroma components. Samples of their respective output signals are combined and shifted 180° in an amplifier to obtain *G-Y* chroma components, thereby providing the basic three pieces of color information.

Sync Detectors

The synchronous detectors (6BE6s) are identical. Chroma information is fed into a grid, pin *7* in both cases. The two subcarrier voltages obtained from the quadrature phase shifter are fed to another grid, pin *1*, in each detector. Therefore, the first grids of the detectors are driven 90° out of phase. In each detector, the subcarrier develops a negative bias on grid *1* by virtue of grid leak and capacitor action. Hence, each detector will conduct only during the most positive portion of its respective subcarrier driving cycle. In effect, the detectors are *gated* into conduction at *B-Y* and *R-Y* phase. Their output therefore respectively contains the *B-Y* and *R-Y* components of the composite chroma signal.

R-Y/B-Y Amplifier

These signals are next amplified by the 6U8 *R-Y/B-Y* amplifier. Sample output signals from these amplifiers are combined in a ratio network. This combined signal is shifted 180° by the *G-Y* amplifier, to provide *G-Y* signal components. *B-Y, R-Y* and *G-Y* voltages are fed to the matrixing circuits which consist of the previously mentioned resistive adders. Here they are each mixed with *Y* picture components to form the blue, red and green picture components, which are further amplified by 12BH7s serving as red, green and blue output amplifiers before presentation to their respective picture tube guns.

B-W Circuitry

Much of the remaining circuitry is quite conventional in its design and has been previously incorporated in many G. E. monochrome receivers.

Noise Canceller Signal

The sync system consists of the usual amplifier, a noise canceller, and sync clipper. The only departure from previous practice is the method by which the activating signal for the noise canceller is derived. For sake of convenience, the polarity of the diode in the chroma detector assembly was chosen to provide positive polarity sync and noise, which is fed to the canceller grid. In previous monochrome systems, a negative polarity sync-plus-noise signal was fed to the canceller cathode. In either case, the canceller cathode is positively biased to allow conduction only after a predetermined noise pulse amplitude has been reached.

20,000 Anode Voltage

The 20,000-volt high voltage necessary to supply the final anode of the picture tube is derived from the horizontal output transformer by means of a Z2176 high efficiency double-type rectifier. This 20,000 volts must be regulated. This is achieved with a Z2188 shunt regulator. The bleeder used in conjunction with the regulator tube is also the source of a 10,000-volt convergence voltage, also needed for picture tube operation.

DC Focus Voltage

There is also a second high-voltage rectifier (1B3G) which supplies 3,000-volts *dc* focus voltage.

Dynamic Convergence

Because a three-gun, planar-type picture tube is used in this receiver, dynamic convergence voltage must be supplied to the convergence anode to compensate for differences in electron beam travel in the picture tube. The dynamic voltage consists of two superimposed waveforms. One is derived from the plate circuit of the vertical output tube and therefore furnishes a parabolic voltage synchronized vertically. The second comes from a winding on the horizontal output transformer. This portion of the dynamic voltage, also a parabolic form, is synchronized horizontally. The two are added in the composite convergence, horizontal blanking 6BL7, and applied to the convergence anode in the picture tube. A portion of this combined dynamic voltage is also applied to the focus anode to provide a dynamic focus voltage.

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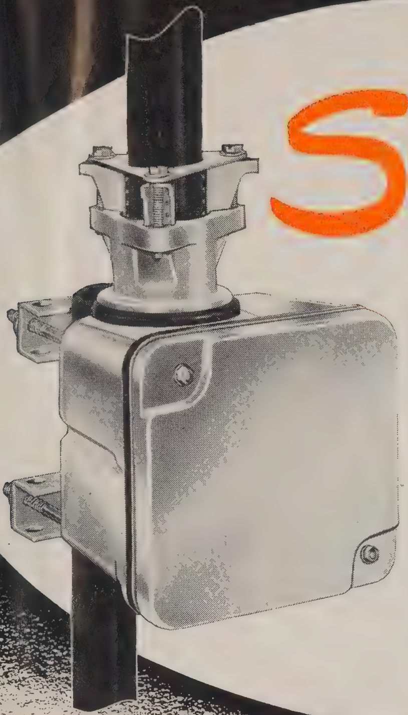

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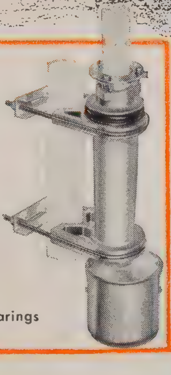

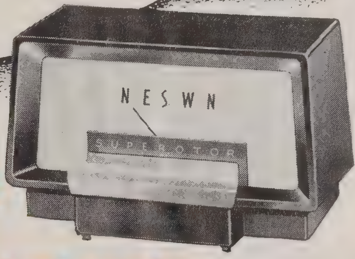

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Servicing Helps

(*Continued from page* 58)

tolerable even under substandard voltage conditions. The average TV viewer did not appear to be very critical of minor shortcomings in reception. However, in cases of extremely poor picture reception quality, and in almost all cases of recurring loss of sync, and like, they were very aware that something was wrong. In these cases they also were very critical of the Service Man's inability to correct it by set adjustments. A surprising number of the set owners mentioned the *bad voltage* or *bad current* condition prevalent in their community. They were very pleased with the improvement in performance quality and stability brought on by installation of the stabilizers.

The definite need for line-voltage stabilization has been demonstrated in the export market: Latin America, Mexico, Cuba, Japan and other countries. Here it has been found that reception is impossible without automatic voltage stabilization.

Few localities in the United States have voltage conditions so poor as to compare with many foreign countries. However, even in an exceptionally good voltage area, the TV Service Man will often be faced with specific cases of adverse line voltage conditions. In communities where line voltage is known to be poor, the use of a stabilizer will be found to be almost a necessity.

Even in the best good voltage areas, power demands are so heavy and er-

Type of Supply	Primary Voltage Applied							
	105		115		120		130	
	Width	Height	Width	Height	Width	Height	Width	Height
Direct Power Line	16¼"	12¾"	17¼"	14¼"	18¼"	15¾"	20½"	17½"
Stabilizer	17¾"	15"	17¾"	15"	17¾"	15"	17¼"	14¾"

Fig. 2. Table illustrating results from a test on a typical 20-inch TV set, where voltage input was varied to note effect on picture size, with and without voltage regulation.

ratic today that the stabilizing device will contribute dramatically to superior video and audio performance.

AGC Adjustments

Many types of circuits have been designed to provide automatic control of gain in TV receivers. Although the circuit is automatic it invariably has an adjustment to set the level at which it is to operate. The importance of the *agc* adjustment is generally overlooked when installing receivers. This is especially true in fringe or semi-fringe areas. Many of these areas have a medium to strong signal and also weak signals.

The *agc* on current RCA[2] chassis leaving the factory is set for an extremely strong signal level in the order of 30,000 microvolts. For best performance in fringe areas proper *agc* adjustments must be made, and these adjustments must be checked upon installation. The *agc* control should be adjusted on the strongest signal at the time of installation. The control should be turned clockwise until the picture just begins to bend or become dark; then one should readjust slightly until there is no bend in the picture. If all signals are weak it my be difficult to obtain a bend in the picture. In this case the *agc* control should be adjusted as far clockwise as possible without encountering any bend in the picture.

Some receivers of other makes use a three-position switch for the *agc* adjustment, making it necessary to change the switch position when changing from weak to strong signals. A potentiometer type of control is used on all recent and current RCA receivers; this has been found to provide a means for selecting a better operating point for the *agc* to meet any signal conditions.

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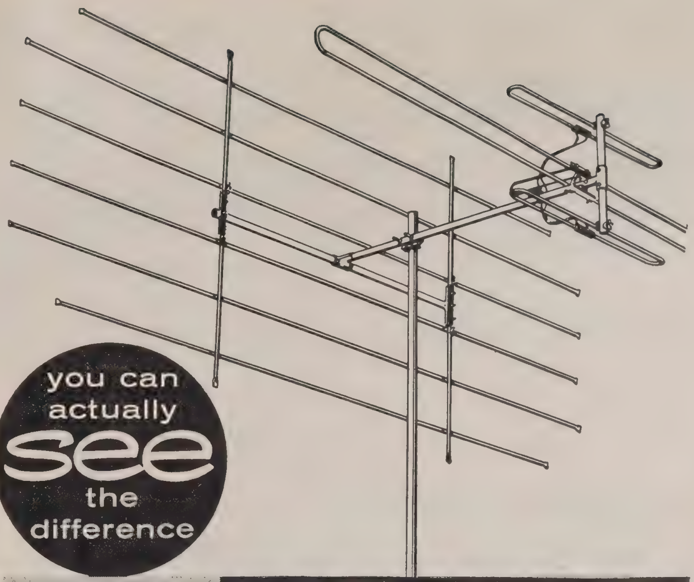
[2] KCS88.



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Tube News

(*Continued from page* 38)

video amplifier, *agc* amplifier, and reactance tube. The triode unit is suited for use in low-frequency oscillator, sync separator, sync clipper, and phase-splitter circuits.

The 5AT8, also a multiunit tube of the 9-pin miniature type having a 4.7-volt/.6-ampere heater, has been designed primarily for use as a combined oscillator and mixer tube in receivers utilizing an *if* in the order of 40 mc.

The 5J6, a medium-mu twin triode of the 7-pin miniature type having a 4.7-volt/.6-ampere heater, has been developed for use as an oscillator, *rf* amplifier, or mixer tube in *vhf tuners.*

The 5U8, a multiunit tube of the 9-pin miniature type with a 4.7-volt/.6-ampere heater, can be used as a combined oscillator and mixer tube in *vhf* TV and AM/FM receivers.

The 12L6GT is a beam power tube of the glass-octal type having a 12.6-volt/.6-ampere heater, for use in the audio output stages.

70°-90° TV Picture Tubes

Wide angle picture tubes, featuring 70° and 90° deflection and approximately 18 and 12 per cent shorter respectively than earlier models, are now coming off the production line.

The 90-degree tubes of one manufacturer[3] include a 17-inch model[4] which measures 16″ in overall length; and a 21-inch type[5], which has a maximum length of 20$\frac{7}{16}$″. Both are directly viewed, rectangular, glass picture tubes with low-voltage electrostatic focus and magnetic deflection.

The 17″ type has a screen size of 14¼″ by 10¾″, with slightly curved

(*Continued on page* 74)

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[3] RCA. [4] RCA-17AVP4. [5] RCA-21ALP4-A.

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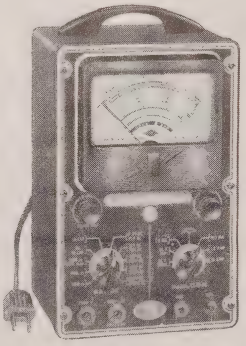

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RESISTANCE: 0 to 1,000/100,000 Ohms 0 to 10 Megohms
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(*Continued from page 73*)

sides and rounded corners, and a nominal projected screen area of 145 square inches. The 21″ tube features a metal-backed screen measuring 19⅛″ by 15″, also with curved sides and rounded corners, and with a nominal projected screen area of 263 square inches.

Both tubes feature a spherical Filterglass faceplate; an external conductive bulb coating which, with the internal conductive coating, forms a supplementary filter capacitor, and an ion-trap gun for use with an external single-field magnet.

Another tube maker has also announced a line of 21″ rectangular tubes with 90° deflection; these are magnetically focused and feature all-glass construction with a grey-glass, spherical face plates[6, 7].

Bulb design provides 263 square inches of screen area. Electron gun has been designed for use with a single-field, external ion-trap magnet.

One of the tubes[7] contains an aluminum-backed screen.

The 90° feature has also been included in 27-inch, aluminized, spherical-face, rectangular, models. One type[8] is a magnetically focused and magnetically deflected tube.

Another, also all-glass and rectangular, and with an aluminized screen, features electrostatic focusing and magnetic deflection.[9] Overall length of this model is $23\frac{1}{16}$″. Total picture area is approximately 425 square inches.

Deflection angles of 70° have been included in 17″ and 21″ models. The 17″ tube[10] is all-glass, rectangular, and contains a gray filter cylindrical face with aluminized screen. It is magnetically deflected and focused for use with single field ion trap. Overall length is $19\frac{3}{16}$″; total picture area is approximately 149 square inches.

The 21″ model[11] is also a rectangular, all-glass, mirror-back type, magnetically focused and magnetically deflected.

Color Tubes‡

A high-voltage, sharp-cutoff, beam-triode regulator tube[12] has been developed for the anode and convergence supplies of color TV receivers.

The tube replaces and supersedes an earlier model[13] and is said to provide three advantages: Increased maximum *dc* plate voltage rating, increased maximum unregulated *dc* supply voltage rating, and increased maximum plate dissipation voltage rating.

[6] CBS-Hytron 21AMP4 and [7] 21AMP4A.
[8] CBS-Hytron 27RP4. [9] Sylvania 27SP4.
[10] Sylvania 17QP4A. [11] CBS-Hytron 21ZP4B.
[12] CBS-Hytron 6BD4A. [13] 6BD4.
‡*Color TV Tube News*, SERVICE; August 1954.

Capacitor Checking

(*Continued from page* 25)

sistance and is expressed in megohms. Here again the value of capacitance affects the limits and is accounted for by expressing the minimum required values of insulation resistance as *megohm-microfarads* or the product of resistance and capacitance.

Insulation Resistance Circuit

A typical circuit for measuring insulation resistance is shown in Fig. 3 (p. 25). Passage of current through the capacitor causes an increase in the negative bias on V_1 and a consequent decrease in plate current. The plate current meter, M_1, is calibrated directly in megohms. At the start of the test, with no capacitor across the terminals, the voltage should be adjusted for full scale deflection (infinite resistance). When the capacitor is connected across the terminals the needle will drop and start to rise at a rate determined, in the main, by the capacitance. Since capacitors of .1 mfd and up require a long charge time, an additional *shot* of voltage is applied by depressing a switch. This will cause the needle to stabilize more quickly.

It should be remembered that the allowable leakage current and allowable insulation resistance are maximum and minimum respectively. Electrolytics which show leakage values well under the maximum, or paper capacitors which are well over the minimum, are in no way defective; if other characteristics are all right.

High-Resistance Capacitors

It probably seems peculiar to consider high resistance a defect in capacitors after analyzing low-insulation resistance troubles. This condition, however, is more prevalent in electrolytic capacitors and is not related to the electrical properties of the dielectric, but rather to those of the conducting parts of the elements itself.

High-Dissipation/Power Factor

High resistance is usually measured in a capacitor as high-dissipation factor, or power factor. A point of referring to the condition as *high resistance* is made because it is in this sense that it becomes confused with *open* capacitors, much the same as leaky capacitors become confused with shorts.

The cause of the high-resistance condition usually is the deterioration of the electrolyte which is a conducting portion of the capacitor plate. In the old days when liquid electrolytes were used, the condition was easily detected by shaking the capacitor and noting the absence of the sound of liquid inside.

The Wien Bridge

By use of a circuit known as a Wien bridge we are able to measure this resistance as a percentage of the total impedance. Since under normal conditions the electrolyte has a finite resistance, there is a maximum allowable percentage depending on the voltage rating of the capacitor. This runs from 15 per cent on high-voltage capacitors to 50 or 60 per cent on very low-voltage capacitors.

Capacitance Change Problems

Probably the easiest type of capacitor trouble to measure and at the same time the hardest to locate is the one involving a capacitor that has changed capacitance value. The conditions which cause a great change in capacitance are many and are seldom apparent in measurement. Many times a reading outside normal limits may

(*Continued on page* 76)

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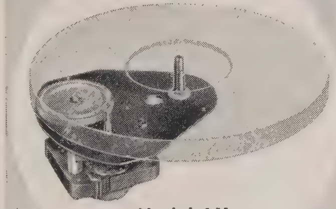
For three-speed applications in which compactness is secondary to need for absolute minimum of stray field radiation. Ideally suited for all types of pickups, including magnetic.

Features include precision construction throughout; oilless motor and turntable bearings, dynamically balanced rotor. Moving lever to "OFF" position automatically disengages idler wheel from motor shaft, and cuts off current.



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Low-priced, single-speed, rim-drive motor suitable for installations where size and cost are prime factors. Incorporates features found in more expensive motors.

OTHER MODELS

A complete line of 78 r.p.m., two-speed and three-speed motors. The popular Model SS (not shown) is a compact 3-speed phonomotor incorporating the vertical idler shift principle and shift lever which disengages idler wheel from motor shaft during non-operating periods.

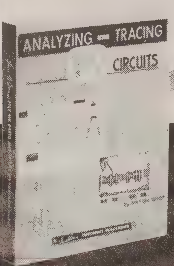
Write for catalog containing dimensions and specifications of these and many other single-speed, dual-speed and 3-speed models in the Smooth Power phonomotor line.

THE GENERAL INDUSTRIES CO.
DEPARTMENT MF • ELYRIA, OHIO

A NEW KIND OF BOOK FOR TV SERVICEMEN

by MILTON S. KIVER

"Analyzing and Tracing TV Circuits"



YOU'LL MASTER ANY TV CIRCUIT

the book that gives you all the knowledge you need and shows you HOW TO APPLY IT

A BASIC BOOK

for EXPERTS or BEGINNERS

Written by an authority who gives you *all* the facts about every TV circuit and then actually tells you how to apply the knowledge for everyday Service SUCCESS and PROFITS. This book spells out in simple, easy-to-understand language the rules a technician must follow to become top-notch in his work—the rules *you* need for assured Service SUCCESS. It's the *one* "must" book for every Service Technician.

CONTENTS: Chapt. 1: Things You Should Know About Every Circuit. **Chapt. 2:** From the General to the Specific. **Chapt. 3:** Differences Between Schematics and Actual Sets. **Chapt. 4:** Following the D.C. Power Lines of a Set. **Chapt. 5:** Where the Boost B+ Fits In. **Chapt. 6:** The A. G. C. System—From Beginning to End. **Chapt. 7:** In and Around the Deflection Systems. **Chapt. 8:** First Things First. **Chapt. 9:** What To Do When You Meet an Unfamiliar TV Circuit. **Chapt. 10:** Summary.

168 PAGES, 8½ x 11" ORDER JA-1. Only.... $3.00 ORDER TODAY

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My (check) (money order) for $................ enclosed. Send .... copy(ies) of "Analyzing & Tracing TV Circuits" (JA-1, $3.00).

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City......................Zone....State.....

(outside U.S.A. priced slightly higher)

(*Continued from page* 75)

be only symptomatic of something else. Conditions of low insulation resistance and high dissipation factor can cause spurious capacitor readings. It is a good idea to make all other tests before attempting to evaluate a capacitor by its capacitance reading.

All capacitors are rated at what is known as *nominal* capacitance. How close the actual capacitance is to the nominal value is determined by the allowable capacitance tolerance for the particular unit. Close tolerances in no way imply that the capacitor, in itself, is of superior quality, but they are an indication of its adaptability to specific circuit requirements. Electrolytic capacitors are allowed rather broad tolerances especially on the high side. While a low side tolerance of 10 per cent is usually maintained, the actual capacitance may be from 40 to 250 per cent above the nominal. Paper capacitors may be allowed 10 to 25 per cent on the low side and up to 60 per cent on the high. These types are commonly used in filter and bypass applications where actual capacitance is not too critical.

Ceramic and mica capacitors which may be used in tuned circuits or similar critical application, may be held to tolerances of 5 per cent or 2 per cent.

Since parts lists are usually quite clear on tolerance requirements it is simply a matter of checking the capacitor against these. Where a replacement is required the most expedient way to satisfy special tolerance requirements is to measure various replacement types at hand and select one within the required range.

Sequence of Tests

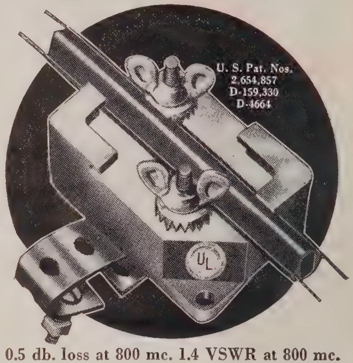
To arrive at the quickest and most accurate conclusion about a capacitor, testing should be done in a logical sequence following the order of the five basic capacitor defects described. In this way it will be possible to avoid spurious readings which are only indicative of another altogether different defect. In addition, it is good practice to evaluate certain capacitor conditions by use of the proper equipment for the specific job. A capacitor cannot be evaluated for insulation resistance by capacitance reading, nor can it be evaluated for capacitance by leakage current measurements. It is also necessary to evaluate the various capacitor types in accordance with their specific performance characteristics. The proper concept of all of these will develop a familiarity with capacitor characteristics that will show a marked saving in time and expense.

FIRST IN ITS CLASS!

JFD ULTRA LOW LOSS

LIGHTNING ARRESTER

The *lowest* loss of them all For VHF-UHF
Exclusive patented strain relief lips



0.5 db. loss at 800 mc. 1.4 VSWR at 800 mc.
For all flat, tubular and open-wire twin lead.

No. AT110 (for wall or window sill mounting) $1.50 list

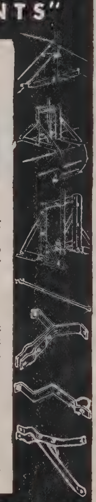
No. AT110S (with stainless steel strap for universal mounting) $1.75 list

Look to JFD for Engineering Leadership

JFD MFG. CO., Inc., Brooklyn 4, N. Y.
EXPORT DIVISION: 15 MOORE ST., N. Y. C.

KENCO KATE SAYS "NO INSTALLATION PROBLEMS when you use KENCO MOUNTS"

KENCO
EAVE
MOUNTS



Easily mounted on hanging rafters or trim boards of eave. Eliminates need for drilling into brick or masonry walls. Ideal for buildings with extended roofs. Hot dip galvanized.

AVAILABLE IN 3 SIZES:
Model #122...22" Eave Mount
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OTHER KENCO PRODUCTS: All-Position Mounts; Parapet Mounts; Sky Struts; "Snap-In" Wall Brackets; "Snap-In" Chimney Mounts; Z-Type Chimney Mounts; Lag Screws and Hardware.

For information on the complete Kenco line write Dept. S.

KENWOOD ENGINEERING CO., INC.
Kenilworth, New Jersey

TV Parts... Accessories

G-C TUNER KLEEN'R

A device that cleans both stationary and rotary contacts of a tuner with each twist of its channel selector, *Tuner Kleen'r,* designed to be installed on any Standard Coil TV tuner, has been introduced by the General Cement Manufacturing Co., 919 Taylor Ave., Rockford, Ill.

Unit consists of four cleaners in each set. One pair is used for the stationary contacts, replacing an unused pair of channel coils in the tuner; other pair, for the rotary contacts, is slipped on the detent side of the tuner frame.

* * *

HI-LO TV STANDS

A line of TV stands, *600,* constructed of wrought iron, is now available from the Hi-Lo TV Antenna Corp., 3540 N. Ravenswood Ave., Chicago 13, Ill.

Model rotates, has expanding side-arms to accommodate any size set, and features roller placement on 16″ centers to support TV sets. Stand is said to be sturdy enough to support sets weighing up to 600 pounds, at any angle without tipping or spreading of legs.

* * *

HALLDORSON FLYBACK FOR CROSLEY AND HALICRAFTERS

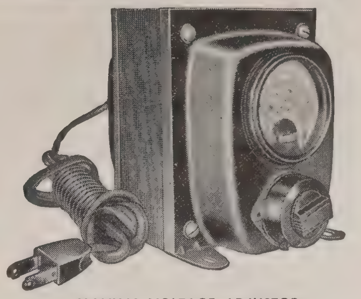
A flyback replacement, *FB417,* designed for the vertical chassis 17″ TV sets now being built by Crosley and Hallicrafters, has been announced by the Gramer-Halldorson Transformer Corp., 2734 N. Pulaski Rd., Chicago, Ill.

Unit incorporates a *hv* rectifier socket and mounting to replace Crosley part *15720-5-1* and Hallicrafters part *550251.* Featured in unit is a non-hygroscopic plastic-coated *hv* coil, Plaskoil, whose dielectric properties, it is claimed, guard against flashovers and breakdowns; also said to be heat resistant for safer *hot cage* operation, structurally stronger to eliminate chipping and cracking, and unlike wax is not brittle.

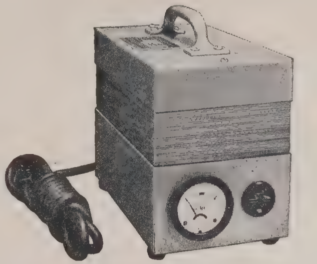
Bulletin No. 118, with complete application data, is available.

2 PROFITABLE TOOLS FOR EVERY SERVICEMAN

EASY TO USE...



MANUAL VOLTAGE ADJUSTOR



...EASY TO SELL

VOLTROL—AUTOMATIC VOLTAGE CONTROL

to control voltage for top TV reception

Here are two instruments that every serviceman should have to detect and correct the effects of low voltage on television receivers. They are easy to use — just plug them into any convenient outlet. They are easy to sell for extra profit — a simple demonstration on a service call easily convinces the set owner that proper voltage is essential to good TV reception.

T-8394M Manual Voltage Adjustor

Where low voltage is causing flicker or shrinking of the television image, the serviceman can detect the condition immediately with an Acme Electric T-8394M Manual Voltage Adjustor. To determine actual line voltage, set the tap switch at 115 volts and the meter reading will show exact line voltage.

Reproducing Complaint Conditions

Complaints of poor reception often indicate a voltage drop at certain times. But by regulating the tap switch over the low voltage range, reception difficulties can be reproduced. The simple demonstration of this fact convinces the set owner that voltage control is necessary. An easy sale is made for the T-8394M Manual Voltage Adjustor to correct the fluctuating voltage conditions. This low cost, quality instrument adjusts voltage over a range from 95 to 125 volts and can be set at the exact voltage for top TV reception. Write for Acme Electric Bulletin VVA-190.

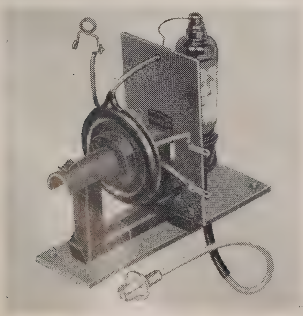
VOLTROL — Automatic Voltage Control

This instrument is completely automatic, requires no adjustment and corrects fluctuation of voltage over a 95 to 130 range. Compact and portable. Just plug it into a convenient outlet, no tools necessary. Built-in relay automatically disconnects the circuit when the set is turned off. Write for Acme Electric Bulletin AV-189.

ACME ELECTRIC CORPORATION
MAIN PLANT: 479 WATER ST., CUBA, NEW YORK

Acme ACME Electric
TRANSFORMERS

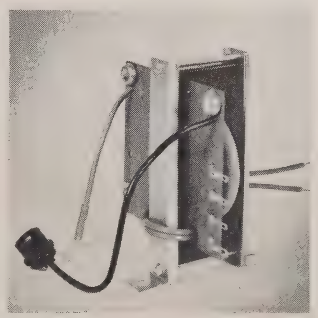
West Coast Engineering Laboratories:
1375 W. Jefferson Blvd. • Los Angeles, Calif.
In Canada: Acme Electric Corp. Ltd.
50 Northline Road • Toronto, Ontario



MERIT-ADMIRAL TRANSFORMERS

Three horizontal-output transformers, *HVO-22-23-24,* designed as exact replacements for similar Admiral units, have been announced by the Merit Coil and Transformer Corp., 4427 North Clark St., Chicago 40, Ill.

All units have mounting brackets, mounting centers, terminal boards and terminal locations exactly comparable to the Admiral TV transformers they are designed to replace.



(Right)
Merit-Admiral Transformers

CAPACITORS
AEROVOX CORPORATION
NEW BEDFORD, MASSACHUSETTS
CAPACITORS
MADE IN USA

Serving the Service Trade Still Better

What's going on here?

Nothing!... if you don't have your brand new

COMPLETELY INSULATED Mueller ALLIGATOR CLIPS!

#63 and #63-C insulated Alligator Clip

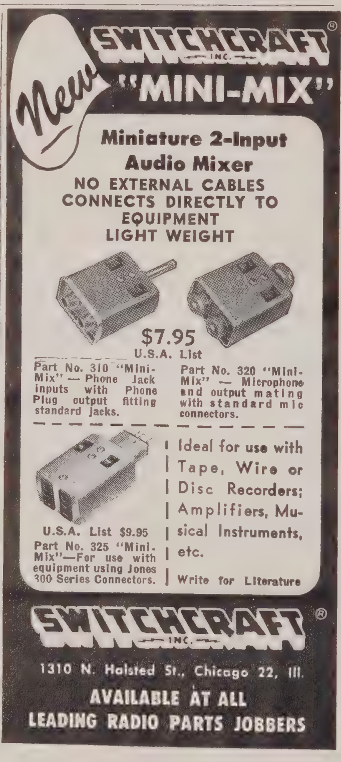
ASK FACTORY FOR FREE SAMPLE OF #63 CLIP

A skin tight, flexing 2-piece Vinyl insulator covers this clip completely—right down to the nose.

Try the free sample yourself! The absolute utility of these slim, completely insulated clips allows their use in tight spots, where the quick convenience of a clip connection has been impossible in the past. Manufactured as a unit only, with factory-applied insulators.

Mueller Electric Co

1573Y East 31st Street • Cleveland 14, Ohio


New SWITCHCRAFT INC. "MINI-MIX"

Miniature 2-Input Audio Mixer

NO EXTERNAL CABLES
CONNECTS DIRECTLY TO EQUIPMENT
LIGHT WEIGHT

$7.95 U.S.A. List

Part No. 310 "Mini-Mix" — Phone Jack inputs with Phone Plug output fitting standard jacks.

Part No. 320 "Mini-Mix" — Microphone and output mating with standard mic connectors.

U.S.A. List $9.95

Part No. 325 "Mini-Mix"—For use with equipment using Jones 300 Series Connectors.

Ideal for use with Tape, Wire or Disc Recorders; Amplifiers, Musical Instruments, etc.

Write for Literature

SWITCHCRAFT INC.

1310 N. Halsted St., Chicago 22, Ill.

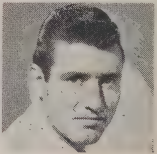
AVAILABLE AT ALL LEADING RADIO PARTS JOBBERS

Rep Talk

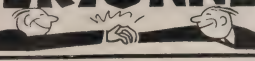
Burton Browne, head of Burton Browne Advertising, Chicago, delivered the principal address at the recent banquet of the Rocky Mountain Conference, sponsored by the Rocky Mountain chapter of The Reps, held at Troutdale-In-The Pines, Evergreen, Colo. . . . A presidents' advisory council, consisting of 16 chapter presidents and three national regional vice presidents, has been formed by the Reps. Council plans to function in an informal liaison capacity between members and the national group. . . . *Robert W. Dansby*, 5526 Dyer St., Dallas, Tex., has been named rep for the V-M Corp., in Texas (excluding El Paso county), Arkansas and Louisiana. . . . *Byron McDonald Co.*, Los Angeles, Calif., is now rep for Krylon Spray Coatings and Dulling Spray, in southern California. *Wayne Beitel Co.*, Birmingham, Mich, will cover all of Michigan, and *John O. Olsen Co.*, Cleveland, Ohio, will cover Ohio and Louisville, Ky., for the company. . . . *Floyd Fausett and Son*, Atlanta, Ga.; *James Gordon*, Detroit, Mich.; *Arthur H. Baier Co.*, Cleveland, O.; *Ed Schulz*, Indianapolis, Ind.; *Charles Kettering*, Aspen, Colo.; *J. R. Hughes*, Buffalo, N. Y.; *Kay Sales Co.*, Kansas City, Mo.; and *Al J. Rissi*, Monrovia, Calif., have been named reps for TV antennas made by American Screen Products Co. . . . *Gordon Dougherty* has formed his own organization, *Gordon Dougherty Associates*, at 2339½ S. Cedar St., Lansing, Mich. . . . *Martin Mann Associates* are now reps for the semi-conductor division of Radar Receptor Co., Inc., in southern California. . . . *Sol Levin and Associates*, 2823 W. Chase Ave., Chicago, Ill. (Illinois, Michigan and eastern Wisconsin), and *Robert T. Brown*, 1533 Merchandise Mart, Chicago, Ill. (Indiana), have been named reps for Pilot Radio Corp. . . . *Wedge Werber Co.*, 1206 Long Beach Ave., Los Angeles 21, Calif. (southern California, Arizona, and southern Nevada), and *William H. Jones Co.*, 84 W. 1st North St., Logan, Utah (Utah, Wyoming, Colorado, New Mexico and Nevada), are now reps for The Quietrole Co. . . . *Jerry Greenberg*, General Cement rep, has moved to 29 Woodmere Blvd., Woodmere, L. I., N. Y. . . . *Weller-Rahe Co.*, Worthington and Columbus, Ohio (Ohio, West Virginia and western Pennsylvania), and *Robert E. Clemenson Co.*, Kansas City, Mo. (Missouri, Kansas, eastern Nebraska and southern Illinois), have been appointed reps for Thordarson-Meissner. . . . *Sid Levin*, 4217 Okalona Rd., Cleveland, Ohio (Ohio, excluding Trumbull, Mahoning, Columbiana and Jefferson counties, Michigan), and *Jack Geartner Co.*, 823 86th St., Miami Beach, Fla. (Florida), have been named reps for Granco Products Inc.

Martin Mann

Gordon Dougherty



PERSONNEL



Joseph F. Whitaker, formerly with IRC, has been appointed vice president in charge of sales of the Weller Electric Corp., Easton, Pa.

J. F. Whitaker

Frank Loasby

* * *

William W. Wexler has been named advertising and sales promotion manager in the equipment sales division of Raytheon Manufacturing Co., Waltham, Mass. . . . Curtis L. Peterson has been appointed assistant ad manager of the TV and radio division. Frank Loasby is now director of sales engineering and service.

* * *

E. L. Anderson has been appointed sales promotion manager for United Motors Service division of General Motors Corp., Detroit, Mich. . . . E. L. Pape, H. P. Schaller and Thomas F. Plant have been named assistant general sales managers. Pape will combine his new duties with those of general merchandising manager, his present position.

E. L. Anderson

E. L. Pape

* * *

Linwood G. Lessig, formerly with J. Walter Thompson Co., has joined the N. Y. office of the Al Paul Lefton Co., Inc., as director of technical advertising. Lessig's background includes fourteen years in the engineering, advertising and sales departments of the RCA tube division.

* * *

Arthur C. Bryan has been named vice president and general manager of consumer products of the National Carbon Co., and William H. Feathers, vice president and general manager of industrial products. . . . Walter A. Steiner is now vice president in charge of development. . . . E. L. Dibble has been appointed general sales manager, consumer products.

W. Feathers

A. Bryan

W. Steiner

STANCOR
1954 TV REPLACEMENT GUIDE
and transformer catalog
lists replacement transformers for over 6800 models and chassis

"Ready NOW!

completely NEW STANCOR TV TRANSFORMER REPLACEMENT GUIDE

The new 1954 Stancor TV Replacement Guide and Catalog is a fully revised, up-to-the-minute listing of accurate transformer replacement data. Every recommendation has been rechecked against the latest information obtainable.

This Stancor reference lists over 6800 TV models and chassis of 115 manufacturers, including hard-to-locate information on "private label" sets.

To make your servicing easier, *virtually all flybacks, yokes and power transformers listed are exact replacements.* Where an exact replacement unit is not available, reference is made to the circuit or terminal changes required.

FREE

If you haven't received your copy, see your Stancor distributor, or write us directly.

STANCOR-WILLIAMSON ULTRA-LINEAR HI-FI amplifier bulletin 479

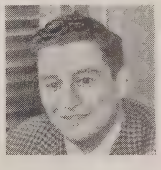
Build your own ultra-linear hi-fi amplifier using Stancor high fidelity output transformer A-8072 ($15.00 net). You can also use A-8072 to convert your present Williamson amplifier to ultra-linear operation. Bulletin 479, available FREE, contains performance curves, schematics, parts lists, chassis layouts and other helpful construction and conversion information.

Stancor transformers are listed in Photofact Folders and Counterfacts.

CHICAGO STANDARD TRANSFORMER CORPORATION
3588 Elston Avenue Chicago 18, Illinois
EXPORT SALES: Roburn Agencies, Inc., 39 Warren Street, New York 7, N. Y.

Norman Rea is now a field engineer for the Technical Appliance Corp., Sherburne, N. Y.

Norman Rea



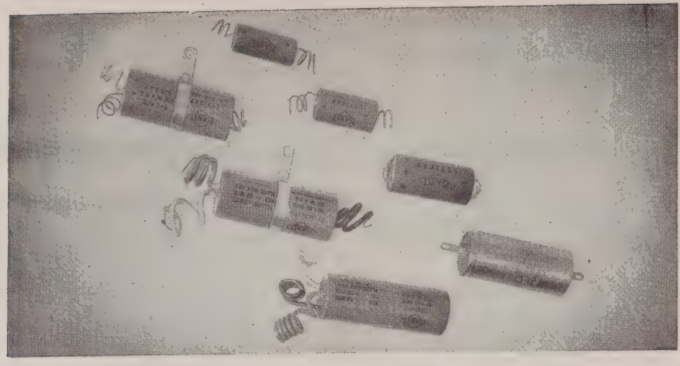
Paul Finkel

Paul Finkel is now assistant to George Strang, purchasing agent for JFD Manufacturing Co., Brooklyn, N. Y. Finkel has just been separated from the U. S. Army.

James C. Sarayiotes, formerly advertising manager of JFD, is now president of Delphi Advertising, Brooklyn, N. Y.

* * *

William Balderston, president of Philco for the past six years, has been elected chairman of the board to succeed James T. Buckley. James H. Carmine, executive vice president, for the past five years, has become president of Philco. As chairman of the board, Balderston will also become chairman of the policy committee and will devote himself to the broad areas of finance, manufacturing, research and engineering and legal and license activities. Carmine, Philco's new chief executive officer, joined the company in '23.



Planet Capacitors *"Engineered for Quality"*

I year service guarantee

Custom engineered to your specifications or supplied from stock, Planet capacitors meet the highest standards of the industry. Every capacitor is tested mechanically and electrically throughout its manufacture.

This rigid system of quality control makes our unconditional one-year guarantee possible. But making Planet capacitors right from the start means reasonable prices too!

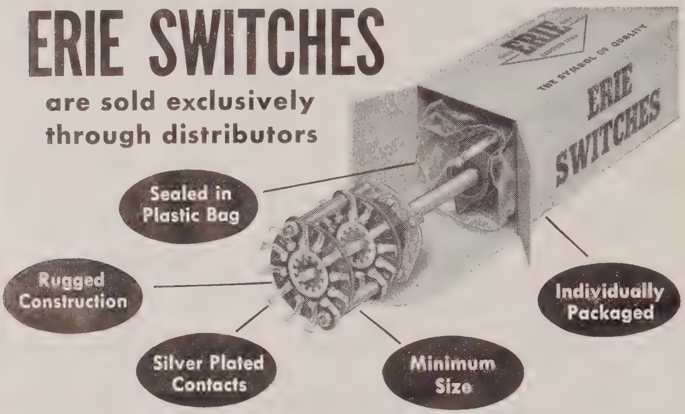
PLANET MANUFACTURING CORPORATION
225 BELLEVILLE AVENUE
BLOOMFIELD, N. J.

PLANET

WRITE *for Catalog 206-B, listing specifications on stock items.*

ERIE SWITCHES

are sold exclusively through distributors



All ERIE Switches have heavily silver plated contacts and high grade phenolic insulators. They meet existing RETMA requirements. The ERIE line consists of 25 items, including shorting and non-shorting types for a wide field of applications in radio, TV, intercommunication, and other electronic equipment.

ERIE Switches are protected in sealed polyethylene bags and individual boxes for preservation and convenient stocking. Each package contains knob and mounting accessories.

Write for complete catalog.

Four Types

- **General Purpose**
- **Single Section**
- **Multi-Section**
- **Lever Action**

ERIE components are stocked by leading electronic distributors everywhere.

ERIE
RESISTOR CORP.

ELECTRONICS DISTRIBUTOR DIVISION
ERIE RESISTOR CORPORATION
Main Offices: **ERIE, PA.**
Factories: **ERIE, PA. • LONDON, ENGLAND • TRENTON, ONTARIO**

Tools . Parts

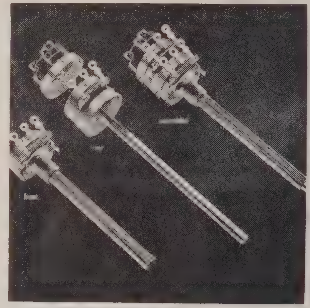
CRL FASTATCH DUAL-CONTROL REPLACEMENTS

A *Fastatch* system of dual-concentric control replacements, claimed to eliminate problem of finding special controls, has been announced by Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis.

In the new approach rear unit has been separated, complete with inner shaft, from the front unit, complete with outer shaft, so that shafts can be cut to the proper length and the units can be *snapped* together. A *Fastatch* switch, if required, can be snapped on to the rear unit.

The number of controls is limited to the differences in resistance and taper; a total of 61 fronts and 65 rears. These 126 controls are said to make possible 4000 combinations.

Replacement information, value, taper, shaft length and application is included in Centralab control guide No. 14. Details on the *Fastatch* system are in Centralab's booklet number 42-218.

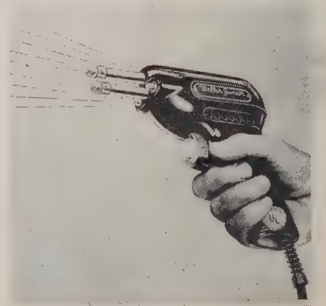


* * *

WELLER SOLDERING GUN

A soldering gun, *Junior model 8100*, with shock-resistant plastic housing and dual spotlights, has been introduced by the Weller Electric Corp., 808 Packer St., Easton, Pa.

Unit is said to provide instant heat at a power rating in excess of 100 watts. Trigger control switches heat on or off. Equipped with a standard replacable soldering tip which can be interchanged with accessory tips for smoothing and cutting.



NEWS

IRC RESIST-O-CARD PLAN

A Resist-o-Card plan, which it is said will afford Service Men substantial savings on ½- and 1-watt type *BT* resistors, has been announced by the International Resistance Co., 401 North Broad St., Philadelphia 8, Pa.

Cards are offered in four assortments giving complete coverage of most called for and often needed ranges. Resistors are removable from stock cards, all of which show individual ranges and RETMA color code chart, and can hang at service bench for reference.

IRC RESIST-O-CARD $5.95

* * *

CREWE NOW WEBSTER ELECTRIC PREXY

Preston G. Crewe, formerly executive vice president and treasurer, of Webster Electric, has been elected president and treasurer.

S. A. Loeb, formerly chairman of the board, has become chairman, executive committee, and *Arthur C. Kleckner,* formerly president, chairman of the board.

David J. Munroe, formerly vice president, manufacturing and engineering is now executive vice president.

* * *

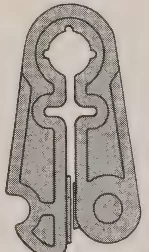
RCP PROBE DISPLAY CARD

A counter display card, to merchandise a universal *hv* multiplier probe, *HVMP-C,* is now available from Radio City Products Co., Inc., Easton, Pa.

Display card emphasizes features and advantages of probe, which it is said may be used with all makes and ranges of *vtvms* and multitesters. Rated at 30,000 *v.*

* * *

NEW!!
iE MANUFACTURING
LINE-LOK STANDOFF
Every Advancement in Standoff Design . . .
PLUS!
FITS MOST STANDARD TYPES OF UHF AND VHF TRANSMISSION LINES Including . . .
OVAL LINE
OPEN LINE
FLAT LINE
TUBULAR ROUND



"DOUBLE-FACE" INSERT adaptable for wide range of UHF and VHF installations; *fits most standard transmission lines — fast, sure!*

INTERLOCKING "LIPS" assure perfect alignment; prevent splitting; *maintain constant locking pressure!*

HINGE-TYPE DESIGN Simplifies insertion of transmission line; *clicks open, snaps shut, stays locked in position!*

PROTECTIVE ZINC PLATING withstands most severe weather conditions; *corrosion resistant, rust proof!*

OPEN-END DRAINS provide outlet for accumulated dirt and dust; *eliminate moisture traps!*

CAM-TYPE SEPARATOR keeps insert tight, firm and flush against metal; prevents *"up-and-down" play, ends "wiggles"!*

Write for literature

iE MANUFACTURING 325 NORTH HOYNE AVENUE, CHICAGO 12, ILLINOIS

CREDIT COMMITTEE CHAIRMAN

(Left)

Edward C. Tudor, president of Industrial Development Engineering Associates, Inc. (I.D.E.A.), Indianapolis, being congratulated by Leslie F. Muter, president of The Muter Company, upon his appointment as chairman of the RETMA Credit Committee.

(Right)

G. Lee Hurlburt (second from left), Lakewood, N. J., Service Man who won the grand prize in the recent RCA $50,000 Tell and Sell tube contest, watching Douglas Y. Smith, vice prexy and general manager of the RCA tube division, officially turn over the prize, a 1954 DeSoto hardtop convertible. Looking on are Robert Bursley (left), field salesman for Krich-New Jersey, who assisted Hurlburt and won a duplicate award; and Sam Robbins, manager of the electronic parts department of the New Jersey distributing firm.

GRAND PRIZE WINNER

LEARN COLOR TV
THIS EASY WAY!
Just off the Press!

ABC OF COLOR TV

$1
THE ABC of COLOR TV
BY H.G.CISIN

H. G. Cisin's remarkable book takes the mystery out of Color TV. The only book which explains this fascinating new TV development in simple down-to-earth manner. It actually translates the highly technical descriptions of research scientists into plain everyday language. Covers basic color principles, compatible color TV system, the color signal, color TV reception, plus practical pointers on color pix tubes, tests, etc. Just the info TV servicemen must have to cash in on this rapidly expanding new field. Profusely illustrated. **Only $1**

NEW! 1955 **TV DOCTOR**
ATTENTION: NOVICE SERVICEMEN!

NEW
H. G. CISIN'S
1955
TV DOCTOR
1
COLOR TV
COMPREHENSIVE REPAIR GUIDE

The new **TV DOCTOR** was written expressly for you by H. G. Cisin, noted TV educator and author. Mr. Cisin has trained thousands of TV technicians, many of them now holding important positions in television. His years of experience are embodied in this valuable book! **TV DOCTOR** contains just the info you need to start in TV servicing. No theory, math or formulas, but full of practical information. Copyrighted Trouble Shooting Guide pin-points hundreds of TV troubles, enabling you to diagnose faults without previous experience. Method applies to all TV sets, old and new. Special chapter on **COLOR TV.** Useful data about TV sets, tuners, antennas, lead-ins, interference, safety suggestions. Many clear illustrations. **Only $1**

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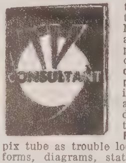

New, easy-to-use way to solve toughest TV troubles. **UHF** section includes conversions, installations and servicing. Modern alignment methods shown by pictures, diagrams and simple directions, tell exactly **what to do** and **how to do it.** Practical pointers on use of all TV Test instruments. Over 300 pix, raster and sound symptoms. Detailed directions tell **where** and **how** to find faulty parts. Over 135 **RAPID CHECKS,** many using pix tube as trouble locator. 125 illustr. of scope wave forms, diagrams, station patterns, show various defects—take mystery out of TV servicing. **NO THEORY—NO MATH—NO FORMULAS**—just practical service info. covering all types of TV sets. **Only $2**

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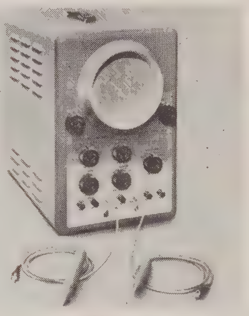
Instruments

SYLVANIA 7" 'SCOPE

A 7" 'scope, *404*, with a vertical sensitivity of 10 mv-per-inch, vertical response flat from 10 cycles to 2 mc (useful to 4 mc), and a square-wave response available to 500 kc, has been introduced by Sylvania Electric Products Inc., 1221 W. 3rd St., Williamsport, Pa.

Instrument is said to have a low internal hum level, and an input impedance of 5 megohms and 26 mmfd for negligible circuit loading. High voltage and demodulator probes are included. Other features include an internal hard-tube multivibrator sweep circuit, linear sweeps from 25 cycles to 50 kc (usable to 130 kc), rapid return trace, control for synchronizing to either positive or negative signals, wide-range phasing control, and an internal 60-cycle sine wave sweep which eliminates one set of leads during alignment operations. Plastic shield for 7VP1A (green trace) *crt* has a low-parallex, cross-lined screen.



Sylvania 7" 'Scope

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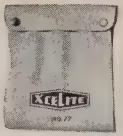

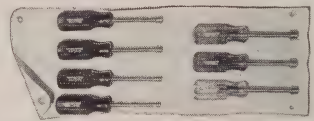

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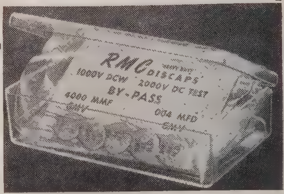

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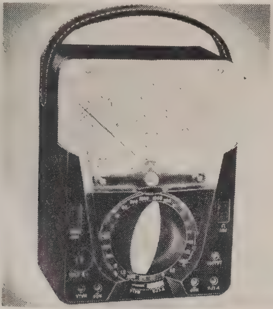
TRIPLETT VOM/VTVM

A two-in-one tester, *631,* that combines a volt-ohm-milammeter and a *vtvm* in a single unit, has been introduced by the Triplett Electrical Instrument Co., Bluffton, Ohio.

Instrument features 34 ranges . . . *vom:* 10 *ac-dc* volts; six *dc;* resistances from .1 ohm to 150 megohms; db and output readings . . . *vtvm:* four ranges, including 1.2-volt range for grid voltage and accurate discriminator alignment. Sensitivity . . . *vom:* 20,000 ohms-per-volt on *dc;* 500 ohms-per-volt on *ac* . . . *vtvm:* 11 megohms. One switch on the unit selects all ranges. Leads with the unit are 48" long, with test prods and removable alligator clips at one end. For the *vtvm* there is a 48" lead with one meg built in.



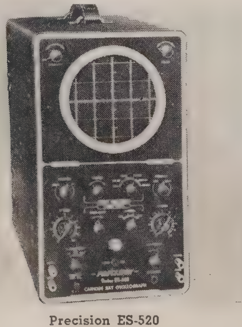
Triplett VOM/VTVM

* * *

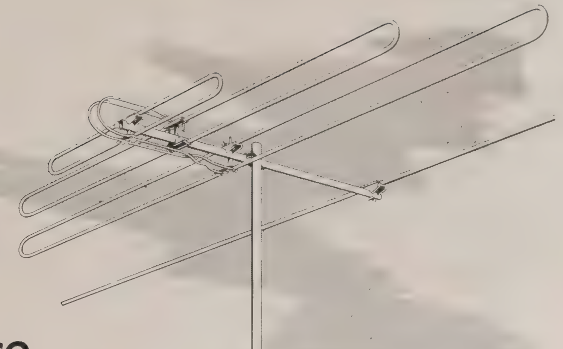
PRECISION 5" 'SCOPE

A general-purpose 5" 'scope, *ES-520,* has been announced by the Precision Apparatus Co., Inc., 92-27 Horace Harding Blvd., Elmhurst, N. Y.

Instrument features push-pull vertical and horizontal drive; 20 mv-per-inch vertical sensitivity; 50 mv-per-inch horizontal sensitivity; 3-step, frequency-compensated, vertical input attenuator; vertical frequency response 20 cycles to 500 kc within 2 db; vertical square wave response from 20 cycles to 50 kc; frequency response 20 cycles to 200 kc within 3 db (at full gain); 1 volt, peak-to-peak, built-in vertical voltage calibrater. Also includes internal linear sweep 10 cps to 30 kc; negative and positive sweep sync selection; internal 60 cycle sync-sweep phasing; beam modulation input terminal; all 4 deflection plates directly accessible at rear, and filter-type, removable graph screen.



Precision ES-520



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Patent Applied For

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- Only the Welco Sabre has Miracle Phase*

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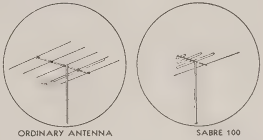
Miracle Phase effectively isolates the undesirable interaction and loading of Phased elements.As used with a bi-philler broadening and phase inverting element, it allows the low band dipole to function with proper gain and pattern response in the high band. This unique coupling of working elements makes it possible to feed the received signal to the set so satisfactorily that the need for many additional elements is eliminated — greatly reducing the physical size of high gain antennas — thus allowing one antenna to fill many requirements — and become the first choice of servicemen.

watch the Sabre create a new standard in antenna design and appearance

introduces a New Look in all channel antenna design



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SCALA DUAL MARKER INJECTOR

A dual marker injector that provides a second marker on the response curve is now available from the Scala Radio Co., 2814—19th St., San Francisco, Calif.

Second mark is generated by a built-in crystal oscillator. Two marks appear on the response curve; one on the picture carrier (the frequency of the marker generator) and the other on the sound carrier (built into the instrument). Injector is equipped with a 4.5 mc crystal (the sound carrier being 4.5 mc away from the picture carrier); a second mark is obtained on the 'scope screen on the other side of the response curve by setting the marker generator at picture carrier frequency.

SIMPSON P-P HF PROBE

A peak-to-peak type of demodulator probe, for checking various video frequency circuits in color TV chassis, has been developed by the Simpson Electric Co., 5200 W. Kinzie St., Chicago 44, Ill.

By use of a video voltage-doubler probe, 'scope having a sensitivity of 0.05 volt-per-inch will provide an effective sensitivity of 0.025 volt-per-inch. Probe operates in the input circuit of the 'scope. It is not limited to color TV tests, and is said to expand the field of signal tracing in b-w receiver circuits. When checking the signal at the grid of the first *if* tube with the probe, deflection can be doubled.

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Annunciator TVI

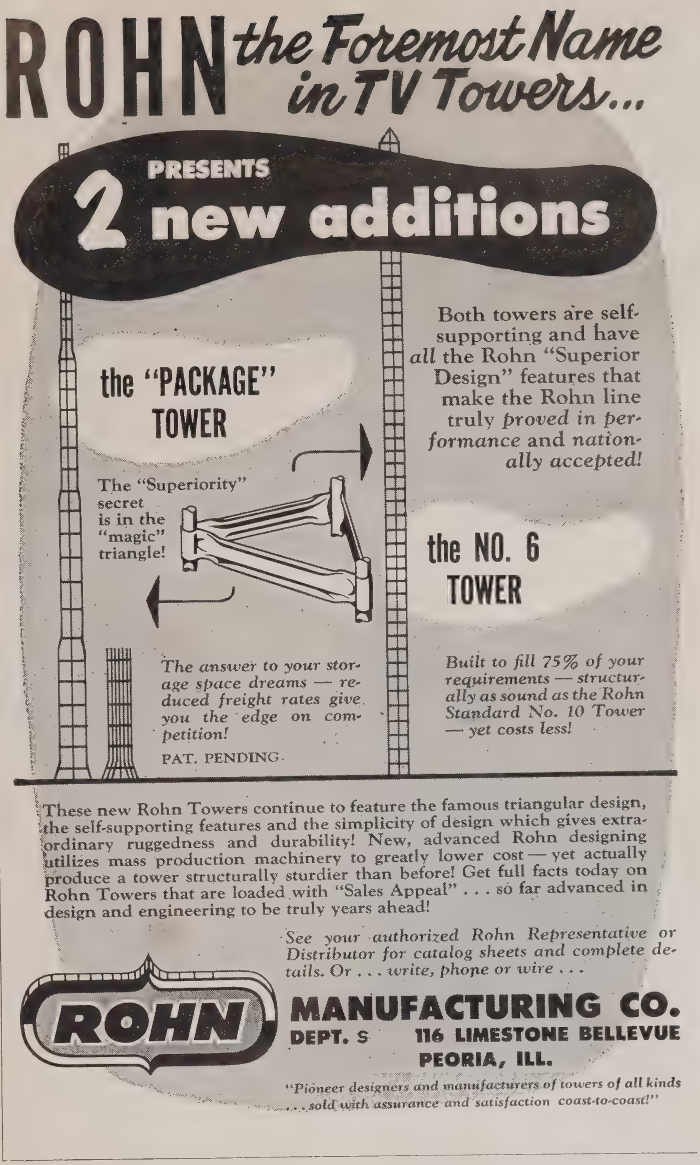
(*Continued from page 29*)

about it. In very general terms, about one-third of the owners of interference-producing equipment will take remedial measures when the trouble is demonstrated to them; about half will allow corrective measures to be used provided it costs them nothing (this usually involves buying Mrs. Jones a door chime, and paying for its installation); and one-sixth will not cooperate or permit any remedies to be applied, even free of charge. Some of this latter group are either unreasonable or irrational, and may claim vociferously: *My interphone couldn't possibly interfere with Mrs. Smith's TV set because it cost $240.00 and has chromium-plated bells. Besides that, she wears a wig—etc.*

Dealings with the first two groups, who constitute a majority of interference producers, are not too difficult. All that is necessary is to present a clear and convincing picture of the situation, and of the necessary remedial measures, in terms that the owner can understand. Let the owner of an interference-producing device hear its effects on a portable receiver or see the waveforms on a 'scope whenever possible. Avoid personlized accusative approaches (*You are interfering with TV sets all over the neighborhood*), and do not try to give orders about interference reduction. (*You must* instructions will not work). Make cooperation as easy and as inexpensive as possible for all concerned.

The remaining sixth of the owners of interference-producing equipment are a serious problem which is not always solvable. In some instances the local electrical inspector can be of assistance. In extreme cases, and only when there is clear and incontrovertible evidence of widespread local interference, Federal laws (and sometimes local laws) regarding radio interference can be invoked. This is a costly and time-consuming procedure, and sometimes produces so much local ill-will that it should be used only as a last resort.

An additional problem often encountered is with the maze of local license laws, local electrical codes, customs and union rules. In general, it is neither desirable nor profitable for a radio and TV Service Man to take on a side line of annunciator wiring. This is customarily done by local electricians or electrical contractors. When a standard installation produces radio and TV interference, the necessary interference elimination work can be done by the Service Man, but major system changes should be referred back to the original installer, who can usually do the work more economically, and whose cooperation will be valuable in preventing future interference difficulties.



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Chain Amplifiers

(*Continued from page* 42)

a consequence, an open heater or other similar fault or even cracked glass will result only in a small decrease in gain, and no appreciable change in frequency response or other characteristics.

Because of its low impedance grid and plate circuits, it has been found that the chain amplifier will burn away minor shorts within the tubes, such as is caused by lint or hair or single strands of the grid windings. It will, however, fail whenever there are low impedance shorts within the tubes. Ordinarily, this is quite rare.

Level Problems and Cures

An amplifier of this type obviously transmits all of the channels through the same tube. If the signal level of any of the carriers is too high, appreciable distortion will obviously result. If it is the picture carrier which has excessively high level, it can modulate the gain of the amplifier for the other channels, resulting in what is known as a *wiper*. To prevent this happening, it is only necessary to keep the signal levels low enough so that this excessive distortion does not occur. Experience has shown that the maximum allowable level on a typical five to seven-channel system is approximately .1 *v rms* peak sync for each of the picture carriers.

New Applications of the Chain Principle

Recently there has been developed a chain amplifier[2] in which band-pass circuits are used instead of low-pass circuits. This amplifier has the theoretical advantages of very great bandwidth and low noise figure, as in conventional chain amplifiers, and the practical advantages of dependability, stability, etc., of its predecessor. When designed to amplify only one channel, much higher gains per tube can be achieved than in the conventional chain amplifier. This new type amplifier is being utilized in channel-pass chain amplifiers[3] for the antenna site equipment of a TV distribution system.

The last few years have seen chain-type amplifiers adopted for many purposes, in the lab as well as in TV. Because of their inherent special advantages, we will probably see them used more and more for low and medium bandwidth work when power output and dependability are important, and for great bandwidth work since no other method has been found to be practical.

[†] The L-3 carrier system now being installed by the Bell System to handle transcontinental high-fidelity transmission of either telephone or TV or both simultaneously transmits 1860 telephone messages or 600 telephone messages and a TV carrier by means of broad-band amplifiers.

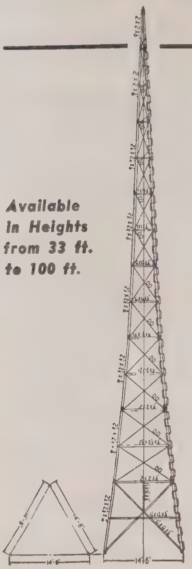
[2] SKL.

[3] SKL series 450.

CBS-HYTRON SERVICE COAT

A service coat, that can be used by service personnel to protect their clothing, has been announced by CBS-Hytron, Danvers, Mass.

Coat features square shoulders, lapels, three pockets, regular-length sleeves, buttoned slit cuffs, reinforced, double-stitched bartacked pockets; available in sizes from 34 to 46. Made of washable, sanforized, colorfast powder-blue herringbone twill. Embroidered CBS-Hytron emblem is on breast pocket.



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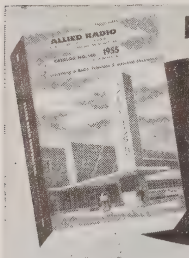

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Safety in Servicing

(*Continued from page* 36)

lethal currents can be delivered. On the other hand a surprise shock from the high-voltage supply can induce sudden dropping of tube or chassis with the result that the tube implodes. A large picture tube makes a respectable hand grenade!

Other Surprise Shock Source

The principle source of a surprise shock is the stored voltage in the tube. The inner and outer conductive coatings normally employed comprise the plates of a high quality capacitor, large charges sometime being stored for hours. This may be avoided by turning the brightness control up full before switching off the set. In this way the beam current will provide a discharge path for the tube capacity and for the power supply in parallel with it. If you want to be doubly sure however, it will be wise to short a length of wire from the chassis to the second anode cavity after the set has been turned off.

Credits

Safety News Letters, Electrical Equipment Section, National Safety Council.

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JOTS AND FLASHES

An All-Time high potential for replacement tube and component sales will be created this year as the result of increases in the use of all types of electronic gear during '54, *Harold F. Bersche,* manager of RCA tube division distributor sales, forecast recently. Emphasizing that the renewal market is keyed to quantities of equipment in use, Bersche said that the 117-million radios in use at the beginning of '54 will increase to 124-million by year's end; record players will increase from 24 to 26-million; and TV sets will increase from 27 to 32-million. . . . . . . On the occasion of the twentieth anniversary of Taco, its two co-founders, *Carl Goudy* and *Herbert Brown,* were presented with tokens of appreciation (a gold watch and set of luggage) by the organization's personnel, highlighting the annual clambake and field day held at the Canaswacta Country Club in Norwich, N. Y. In '34, Goudy and Brown founded Taco in Long Island City, N. Y. Later in the year, *Tore Lundahl* and *James Cullen* joined the organization in sales and production capacities. . . . The RCA Service Co. has established three West Coast area offices to handle Antenaplex TV system business: 718 Dearborn St., Seattle, Wash. (*Edward Long* is rep for this area); 911 N. Orange Dr., Hollywood, Calif. (*Warren Burr* reps here); and 2640 Bayshore Blvd., San Francisco (*Edward Norton* is rep for this area). . . . . . . *E. Finley Carter,* vice president and technical director of Sylvania Electric, has been named manager of research operations of Stanford Research Institute. Carter will retain an association with Sylvania, assisting in contacts with the Department of Defense and consulting on major research and development contracts. . . . *Robert G. Scott* has been named assistant sales manager of the DuMont cathode-ray tube division. . . . *Keeton Arnett* is now vice president, administration, of Allen B. DuMont Labs, Inc. . . . Tech-Master Corp., formerly located at 443 Broadway, N. Y. C., is now located at 75 Front St., Brooklyn, N. Y. . . . *Ira Kamen* is writing a book on Subscription TV for Howard W. Sams and Co., Inc. . . . *Leon B. Ungar,* of Ungar Electric Tools, Inc., Venice, Calif., has been elected president of the Radio Parts and Electronic Equipment Shows, Inc., sponsors of the industry's annual Electronic Parts Show. *Karl Jensen,* Jensen Industries, Chicago, was named secretary, and *Bernard L. Cahn,* Insuline Corp. of America, Manchester, N. H., was reelected treasurer.

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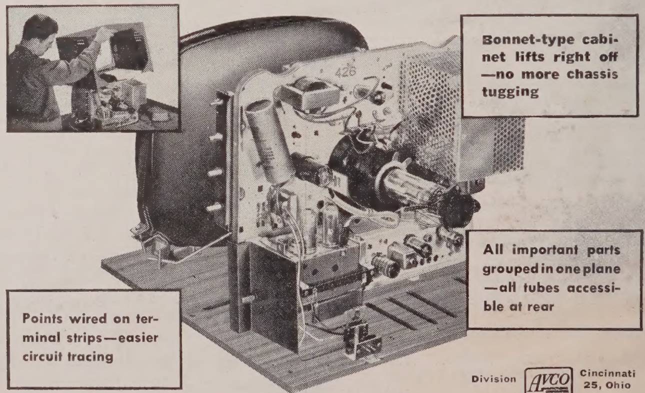
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